RUBBER WORLD

SERVING THE RUBBER INDUSTRY SINCE 1889

FEBRUARY, 1959

A BILL BROTHERS PUBLICATION

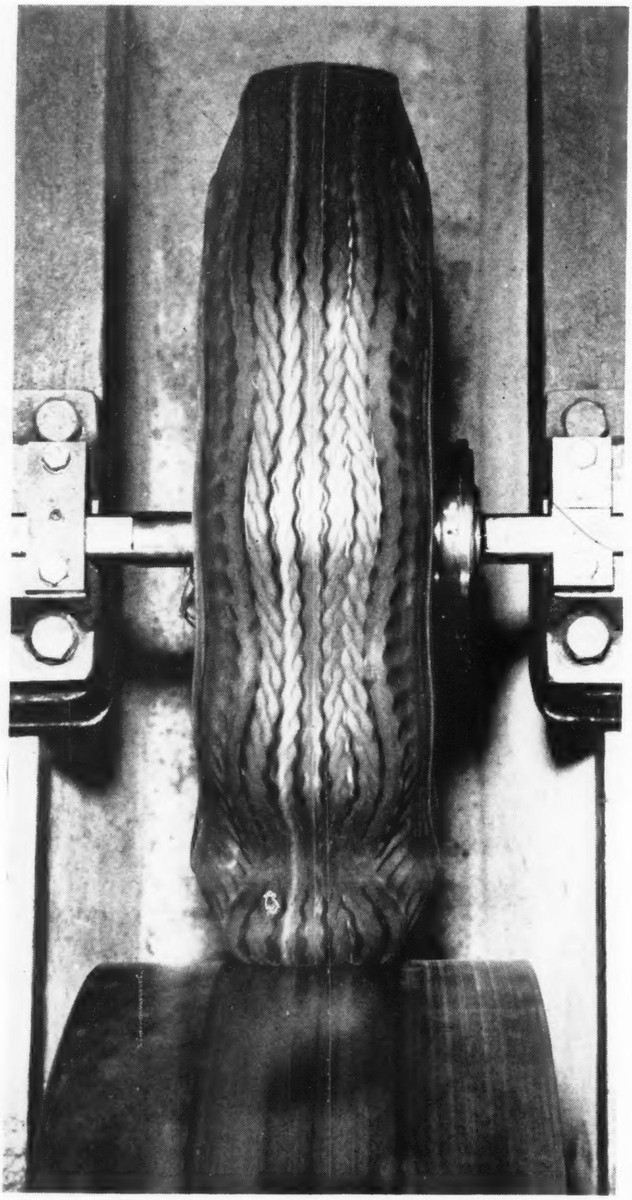
"Beehive" Dome of World's Largest Private Nuclear Reactor at Princeton

See page 723

From Du Pont...

THERMOFLEX A

...for heat degradation and flex-cracking resistance



Use THERMOFLEX A in tire treads, conveyor belt covers and other rubber products that call for maximum protection from heat and flexing degradation.

Other Du Pont antioxidants are:

AKROFLEX C Pellets
AKROFLEX CD Pellets
ANTOX
NEOZONE A Pellets
NEOZONE D
PERMALUX
ZALBA

For more information about THERMOFLEX A or any of the above antioxidants, contact your nearest Elastomer Chemicals Department District Office.

This tire—on a test wheel—is being tested at 118 m.p.h. THERMOFLEX A gives the tire protection against degradation caused by heat and flexing.

DU PONT
REG. U. S. PAT. OFF.

RUBBER CHEMICALS

Better Things for Better Living . . . *through Chemistry*

RUBBER WORLD, February, 1959, Vol. 139, No. 5. Published monthly by BILL BROTHERS PUBLISHING CORP. Office of Publication, 3rd & Hunting Park Ave., Philadelphia 40, Pa., with Editorial and Executive Offices at 630 Third Avenue, New York 17, N. Y., U.S.A. Second Class Postage Paid at Philadelphia, Pa. under the act of March 3, 1879. Subscription United States $5.00 per year; Canada $6.00; All other countries $7.00. Single copies 50¢. Address Mail to N. Y. Office.

RUBBER WORLD

ARTICLE HIGHLIGHTS

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NBP BPA

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VOLUME 139, NUMBER 5 FEBRUARY, 1959

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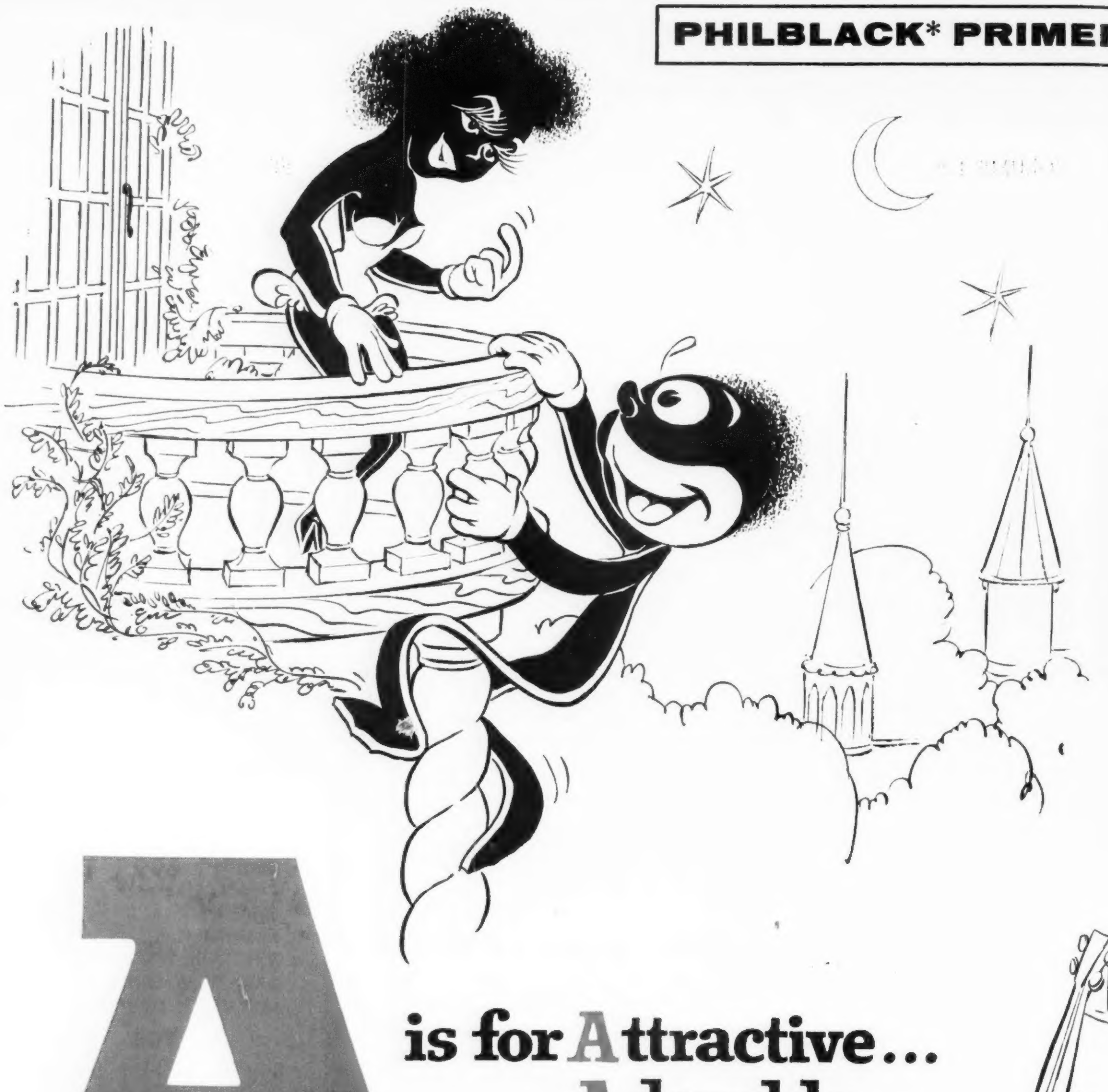
Cover photo: Courtesy of Industrial Reactor Laboratories, Inc.

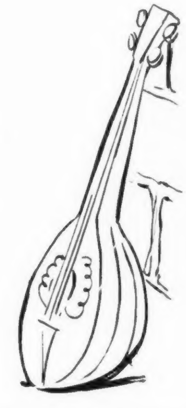
The opinions expressed by our contributors do not necessarily reflect those of our editors

FEATURE DEPARTMENTS

PHILBLACK* PRIMER



A is for Attractive... Adorable... Alluring!



It's love at first sight . . . when you use Philblack A! Rubber products come out of the molds with a smooth, satiny surface and a pleasant, rubbery "feel." Extrusions, too, are easy and accurate. And your whole plant operation . . . from A to the finished product . . . is more efficient.

There are four Philblacks in all, each with its own special advantages. See the descriptions at right. For more detailed information, consult your Phillips technical representative. Remember, also, that Phillips maintains a modern technical laboratory to assist with *your* individual rubber problems. Take advantage of this valuable service.

LET ALL THE PHILBLACKS WORK FOR YOU!

A — **Philblack A, Fast Extrusion Furnace Black.** Excellent tubing, molding, calendering, finish! Mixes easily. Disperses heat. Non-staining.

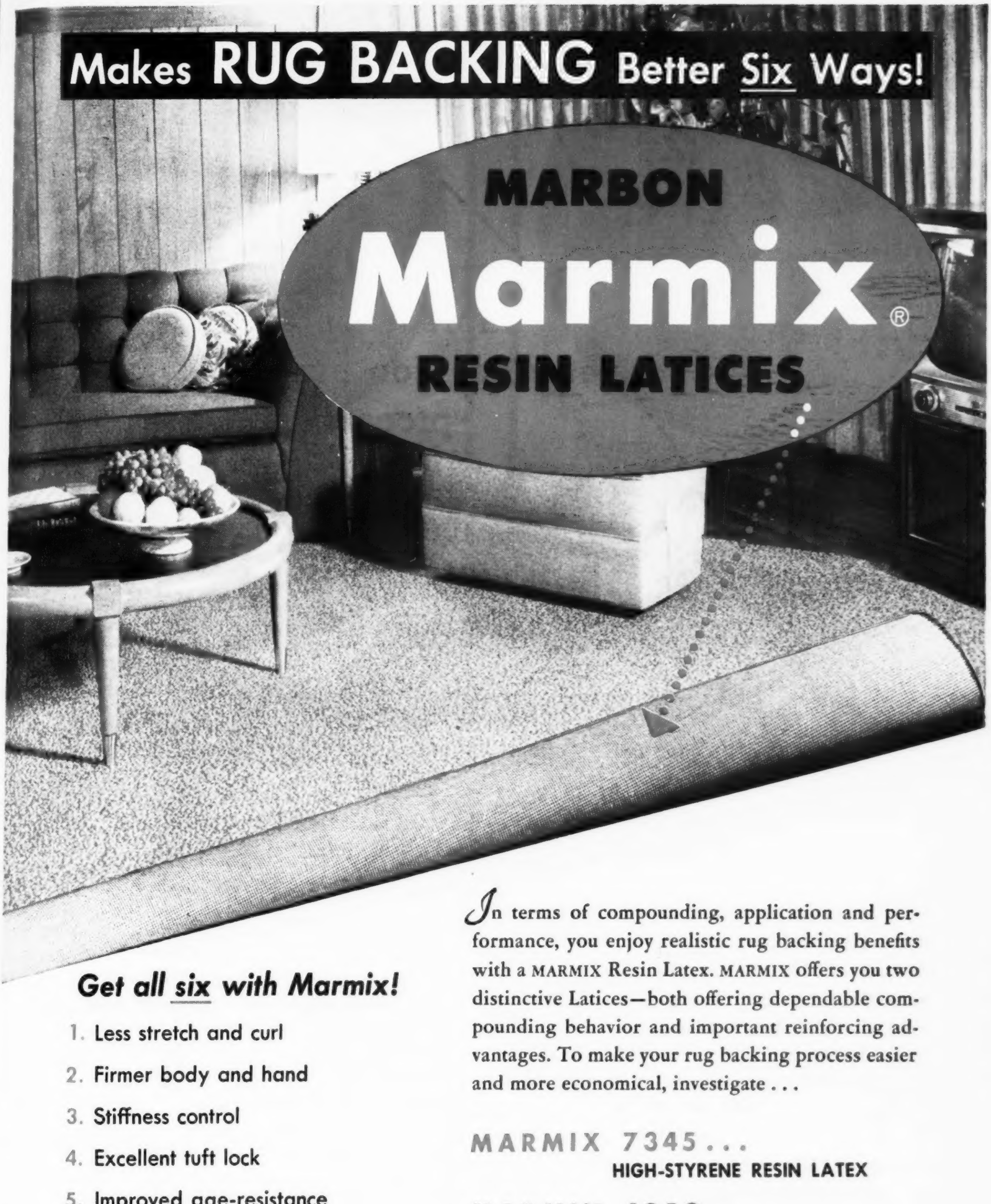
O — **Philblack O, High Abrasion Furnace Black.** For long, durable life. Good conductivity. Excellent flex life and hot tensile. Easy processing.

I — **Philblack I, Intermediate Super Abrasion Furnace Black.** Superior abrasion. More tread miles at moderate cost.

E — **Philblack E, Super Abrasion Furnace Black.** Toughest black yet! Extreme resistance to abrasion.

*A trademark

PHILLIPS CHEMICAL COMPANY, Rubber Chemicals Division, 318 Water Street, Akron 8, Ohio • **District Offices:** Chicago, Dallas, Providence and Trenton • **West Coast:** Harwick Standard Chemical Company, Los Angeles, California • **Warehouse Stocks** at Akron, Chicago, Trenton, Brighton, Mass. and Toronto, Canada • **Export Sales:** 80 Broadway, New York 5, New York • **European Office:** Phillips Chemical Company, Limmatquai 70, Zurich 1, Switzerland.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MARBON
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Service!


MUEHLSTEIN

MONSANTO RUBBER CHEMICALS
ANSWER ANOTHER
IMPORTANT COMPOUNDING
QUESTION:

What delayed-action sulfenamide accelerators are my easiest-to-use, surest protection against scorch?

ANSWER:

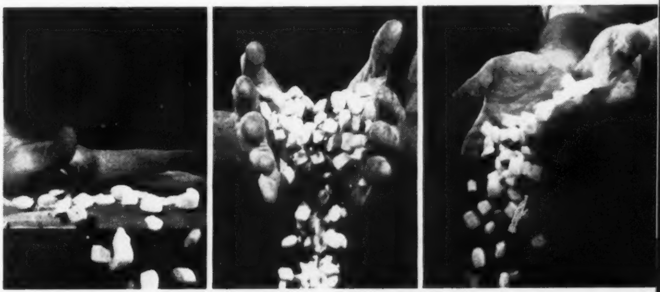
New Santocure and Santocure NS "BRIQUETTES"

ACTUAL SIZE

Look how new BRIQUETTES of Santocure and Santocure NS give you more plant-handling ease and convenience. Free-flowing BRIQUETTES won't pack, "bridge" and surge like dry powders—are ideal for automatic weighing or scoop handling. No weighing losses. No rolling! No sticking to the throat or ram of the banbury. Now, with maximum ease of weighing and handling, you can be sure of the delayed-action, safer cures that the Santocures are known to give.

Still the most popular and lowest cost, Santocure was the first uniformly successful sulfenamide accelerator. Powerful Santocure NS gives even greater safety from scorch—up to 10% less accelerator may be used for similar fast, flat curing rates.

Whenever scorch problems threaten . . . from more rapid processing, higher temperatures, thicker sections, greater activation from reinforcing furnace blacks . . . try Santocure or Santocure NS BRIQUETTES. Write for sample and technical help in your application.



WON'T CAKE! WON'T BRIDGE! ALWAYS FLOW FREELY, BUT WON'T ROLL

Santocure: Monsanto T. M. Reg. U.S. Pat. Off.

LET MONSANTO RUBBER CHEMICALS ANSWER YOUR NEXT COMPOUNDING QUESTION

Jot it down on the nearest sheet of paper and send it in with your return address. No obligation—no salesman will call (unless you so request). To help you solve specific problems, Monsanto draws from basic knowledge of more than 85 rubber chemicals and over 18,000 compounding studies. Write, today.

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Please send me a sample of new

☐ Santocure BRIQUETTES ☐ Santocure NS BRIQUETTES

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Company ....

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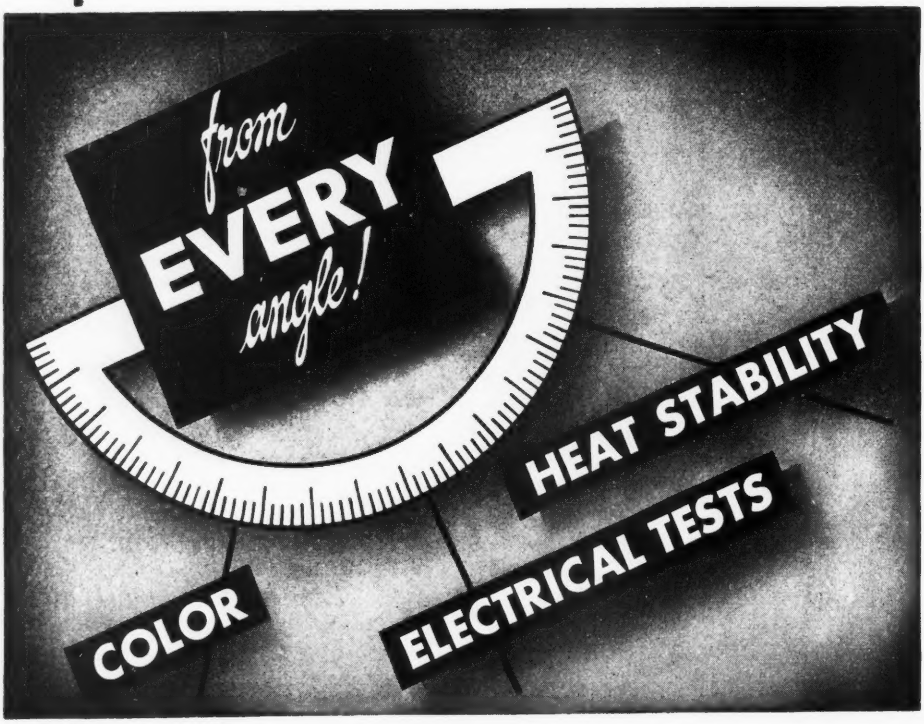
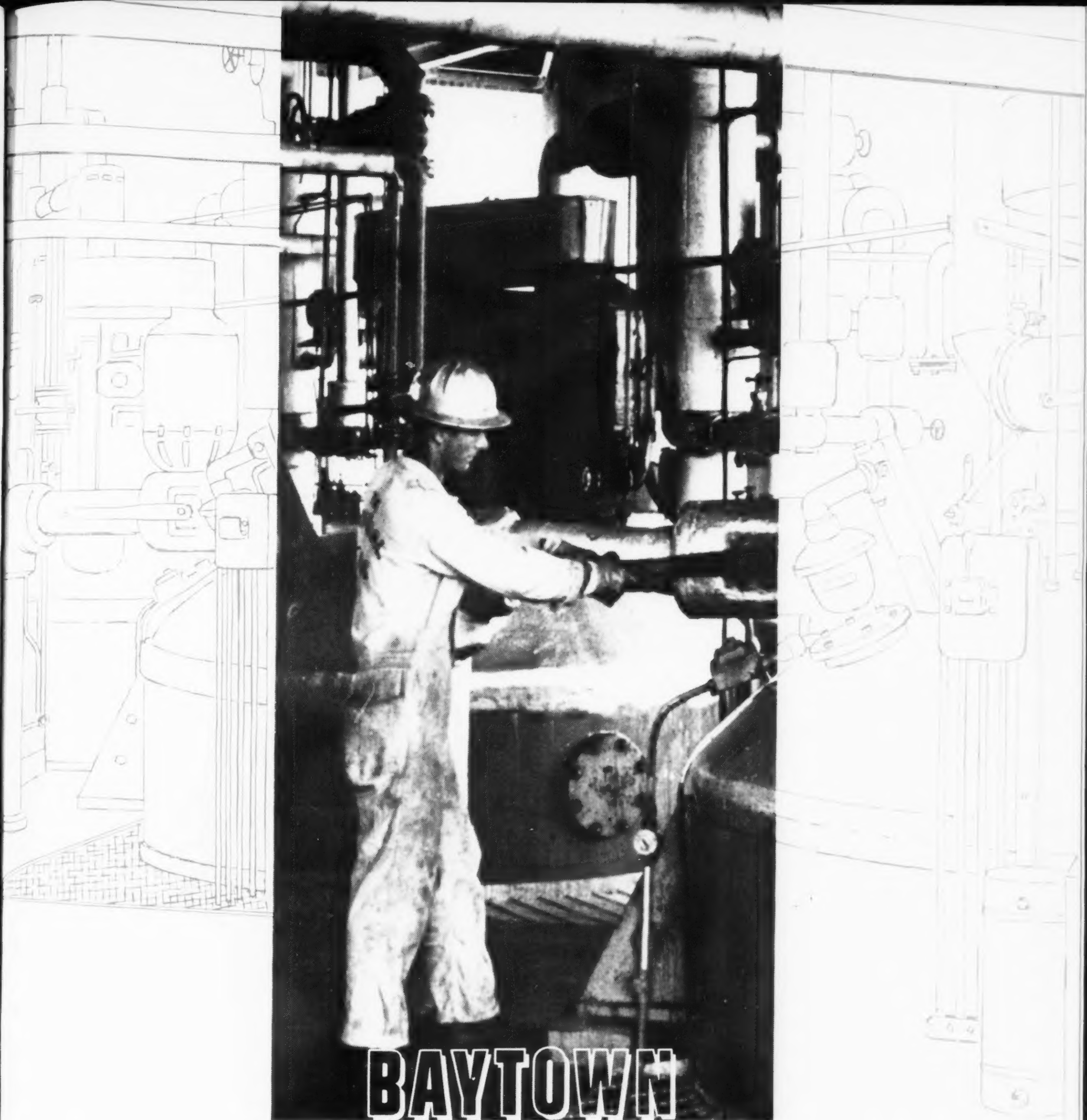
City .... Zone .... State ....


from
EVERY
angle!
HEAT STABILITY
ELECTRICAL TESTS
COLOR



NEW

antiozonant-antioxidant

Here's a new, all-purpose antiozonant-antioxidant that combines superior flex cracking resistance with outstanding resistance to weather and ozone attack. Highly effective against both heat and oxygen too, FLEXZONE 6-H is an excellent chemical for the improvement of age resistance and fatigue life of rubber products.

Since it is provided in free flowing powder form, FLEXZONE 6-H is cleaner and easier to handle than liquid antiozonants. It disperses readily in mill or Banbury mixes, and is essentially non-migratory.

Let FLEXZONE 6-H give *your* tire sidewalls, treads, retread rubber and other rubber products a new measure of resistance to weather, age, fatigue, and flexing. To learn more about FLEXZONE 6-H, contact your nearby Naugatuck representative or the address below.

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Division of United States Rubber Company 210R Elm Street Naugatuck, Connecticut

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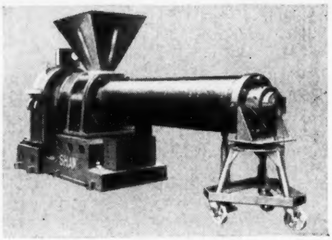
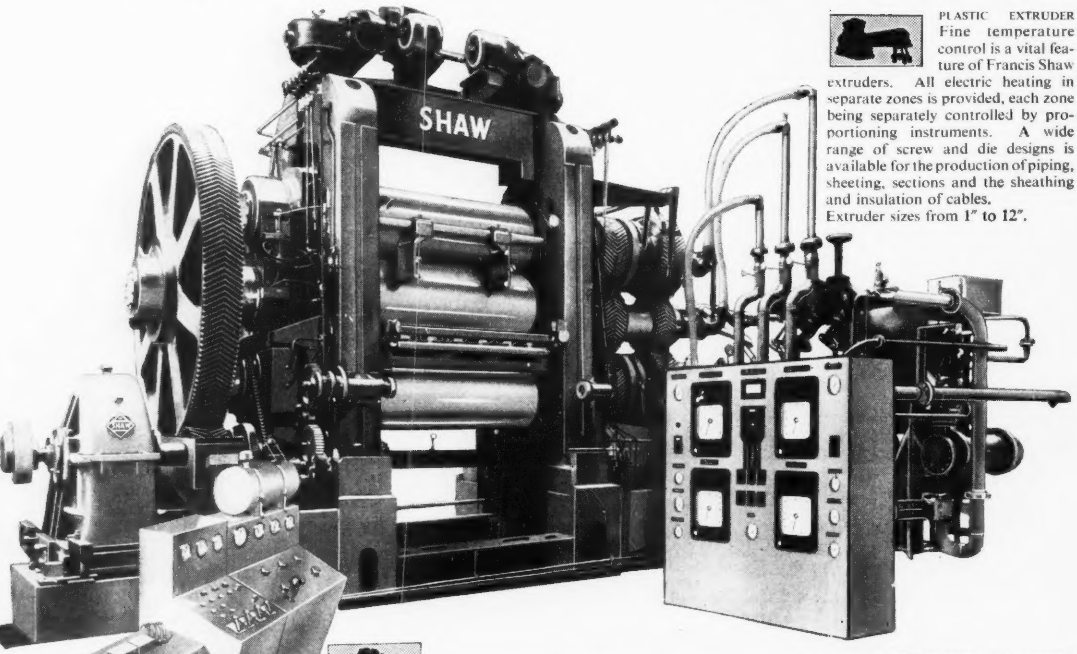
FRANCIS
SHAW

quality engineering puts efficiency into Shaw machines

The cost-cutting performance of every Francis Shaw machine and its thorough dependability are the result of long experience and unvarying high standards of engineering in every detail of manufacture.

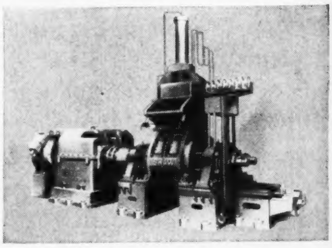
Close-limit accuracy and rigorous inspection during manufacture guarantee to the user a consistently high quality output from Francis Shaw equipment.





PLASTIC EXTRUDER Fine temperature control is a vital feature of Francis Shaw extruders. All electric heating in separate zones is provided, each zone being separately controlled by proportioning instruments. A wide range of screw and die designs is available for the production of piping, sheeting, sections and the sheathing and insulation of cables. Extruder sizes from 1″ to 12″.

CALENDER. A comprehensive range of Francis Shaw Calenders is available for the processing of all rubber and plastic materials. Flood Lubrication and hydraulic roll balancing available on all production sizes. Roll Bending can be fitted as an additional refinement. All sizes available from 13″ x 6″ to 92″ x 32″. Two-, Three- and Four-Bowl Designs.



INTERMIX. A robust, high efficiency Heavy Duty Internal Mixer for mixing plastic compounds at lower-than-normal temperatures. It is supplied with steam heating for plastics and other materials, and the exclusive rotor design ensures consistent high quality mixing.

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QUALITY ENGINEERING FOR QUANTITY PRODUCTION

Francis Shaw are available for the design, manufacture, and installation of a wide range of processing equipment

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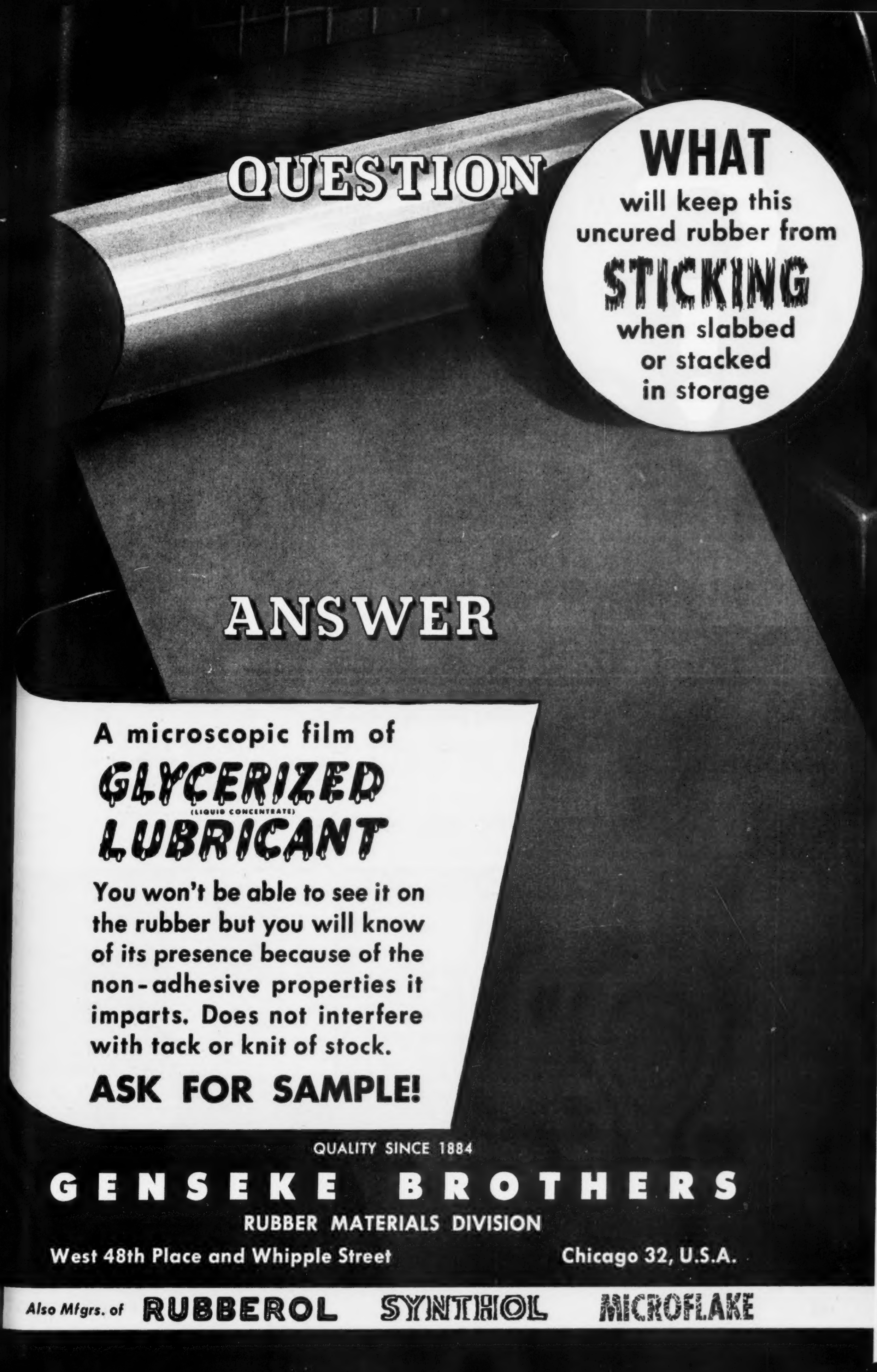
QUESTION
WHAT
will keep this
uncured rubber from
STICKING
when slabbed
or stacked
in storage
ANSWER
A microscopic film of
GLYCERIZED
(LIQUID CONCENTRATE)
LUBRICANT
You won't be able to see it on the rubber but you will know of its presence because of the non-adhesive properties it imparts. Does not interfere with tack or knit of stock.
ASK FOR SAMPLE!
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RUBBER MATERIALS DIVISION
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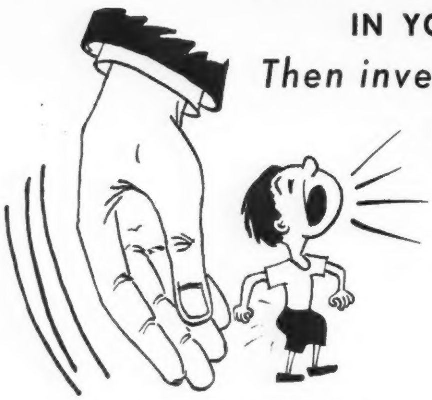
Also Mfgrs. of
RUBBEROL
SYNTHOL
MICROFLAKE

HAVE YOU A "PROBLEM CHILD"

IN YOUR COMPOUNDING DEPARTMENT?

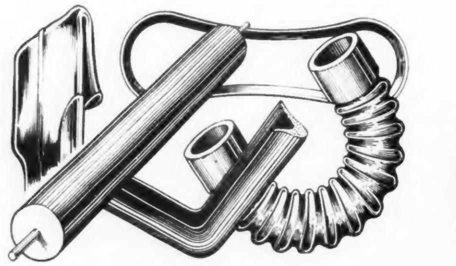
Then investigate these helpful "Factice" facts!



Neophax is

- compatible with Neoprene, synthetics, and crude rubber,
- aids in processing,
- improves extrusion, maintains die size,
- stabilizes mold dimensions,
- permits wide durometer range,
- yields ultimate plasticizing.

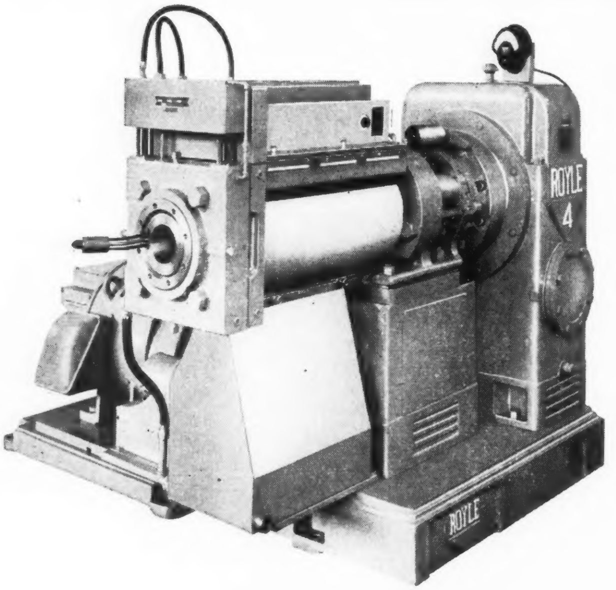
FACTICE® *Neophax*®



Feel free to submit your problems to us. Just explain your difficulty, or describe the effect you wish to achieve. Without obligation, our laboratory will gladly make helpful recommendations. Data on request any time.

"Factice" THE STAMFORD RUBBER SUPPLY CO. Vulcanized Oil

THE STAMFORD RUBBER SUPPLY CO., STAMFORD, CONN.



ROYLE SPIROD®

For Maximum Versatility

Whether you are extruding plastics that require high processing temperatures or quick-curing compounds Royle Spirod —the all purpose, all-electric, completely automatic extruder —provides positive temperature control. This versatility is the result of combining a proportioning controlled system of high velocity evaporative cooling with tubular resistance heating to supply constant, accurately zoned processing temperatures.

Send for Bulletin Number 463

JOHN ROYLE & SONS

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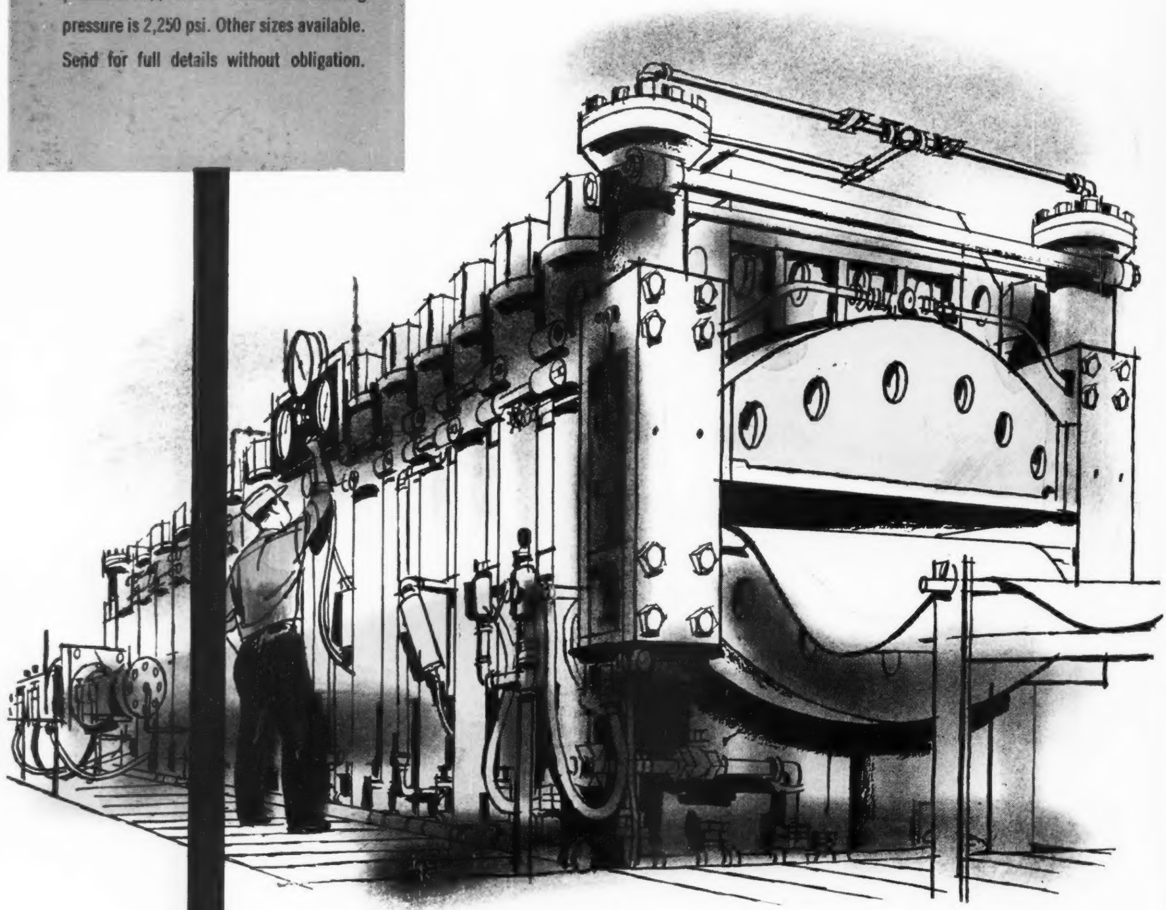
PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN 1880

London, England	Home Office	Akron, Ohio	Downey, Cal.	Tokyo, Japan
James Day (Machinery) Ltd.	V. M. Hovey J. W. VanRiper	J. C. Clinefelter Co.	H. M. Royal, Inc.	Okura Trading Co., Ltd.
Hyde Park 2430 - 0456	SHerwood 2-8262	BLackstone 3-9222	TOpaz 1-0371	(56) 2130 - 2149

The standard by which other presses are judged

Single Opening Belt Press for vulcanizing rubber belting. Press is equipped with hydraulic stretcher and clamping units mounted at the ends of the moving platen. Press capacity is 3,180 tons. Size of heating platens is 63¼" x 30'0". Maximum working pressure is 2,250 psi. Other sizes available. Send for full details without obligation.

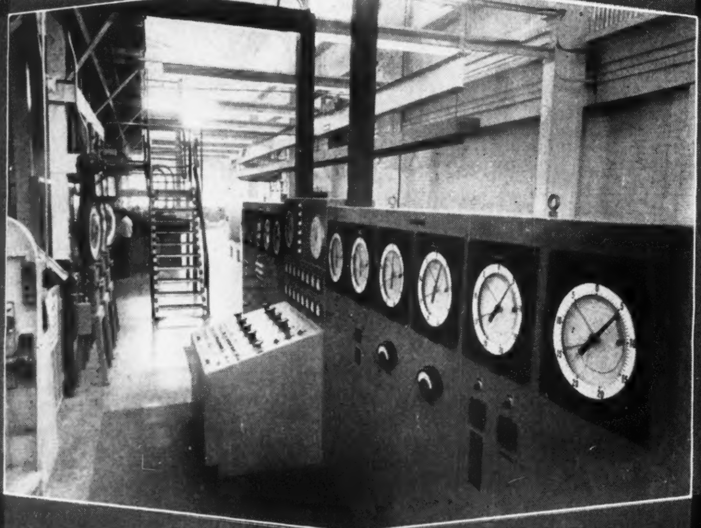
The proof of any press is its performance: excellence invariably shows up in service. How to be sure of quality when you choose a press? Simply look for the name 'R. D. Wood' on the nameplate. In every R. D. Wood Press, sound design, select materials, skilled craftsmanship combine to give you over-all efficiency, operating ease, production economy and long service. Write for engineering data on R. D. Wood Presses for the rubber industry.



R. D. WOOD COMPANY

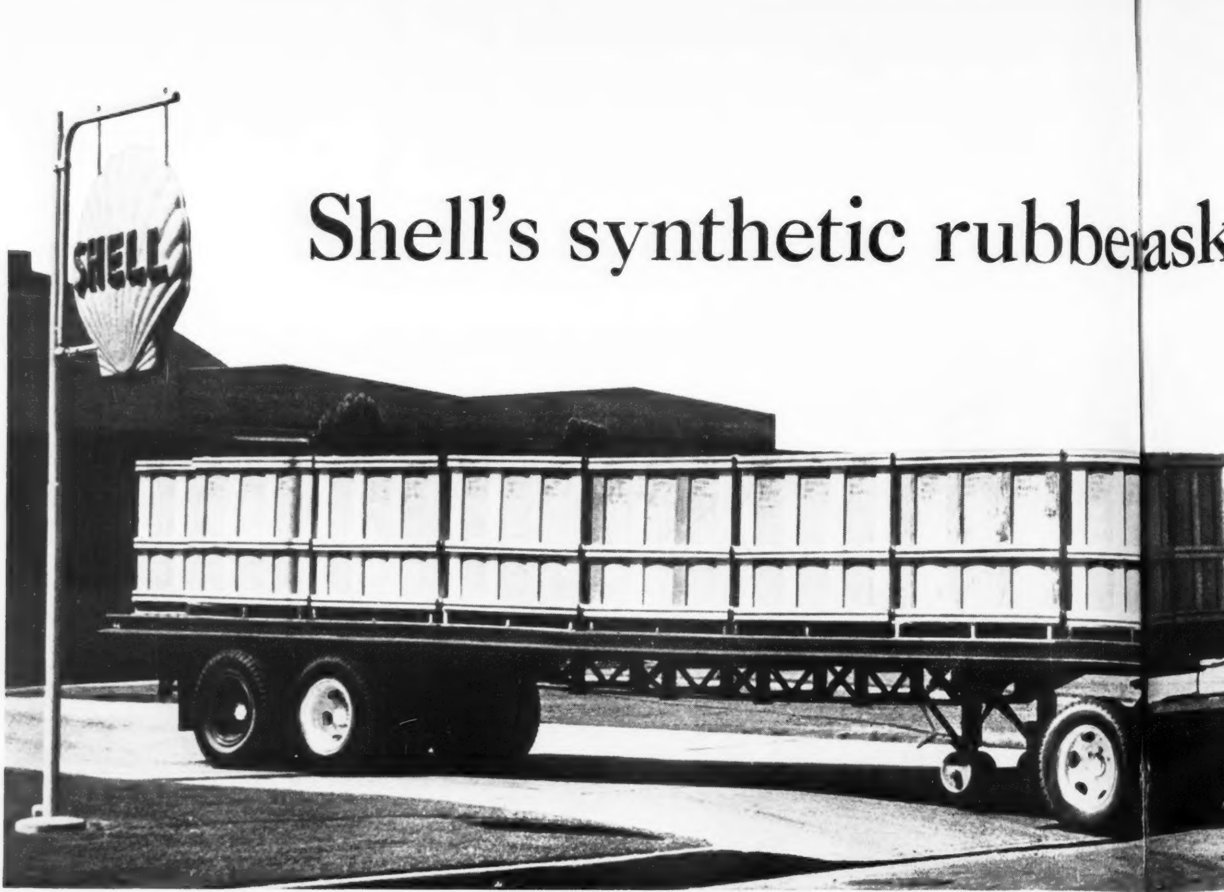
PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA


KO-BLEND...
the best way known
to assure
flawless whitewalls



Shell's synthetic rubbe

ask



...at your service with th

vid

synthetic rubber from on

dep

NEW "FLOTAINER" CONTROLS COLD FLOW

Shell offers you the Flotainer* package, a strong, lightweight, steel-strapped wooden container that holds 42 film-wrapped bales. Completely new in principle, "Flotainer" controls cold flow in uncured synthetic rubber; prevents contamination; simplifies and speeds handling; lets you store 20 tons of rubber on less than 100 sq. ft. of floor space. For more information on this packaging innovation, write Shell for an illustrated bulletin.

*Shell Chemical Trademark

When you need general-purpose synthetic rubbe remember that Shell Chemical has at Torranc California, the widest selection of commercial an experimental polymers available from a single sourc

You can choose a Shell polymer for many uses, o one of Shell's many new additions (some ar specially tailored to fill specific needs) to help im prove your product, save time, reduce costs.

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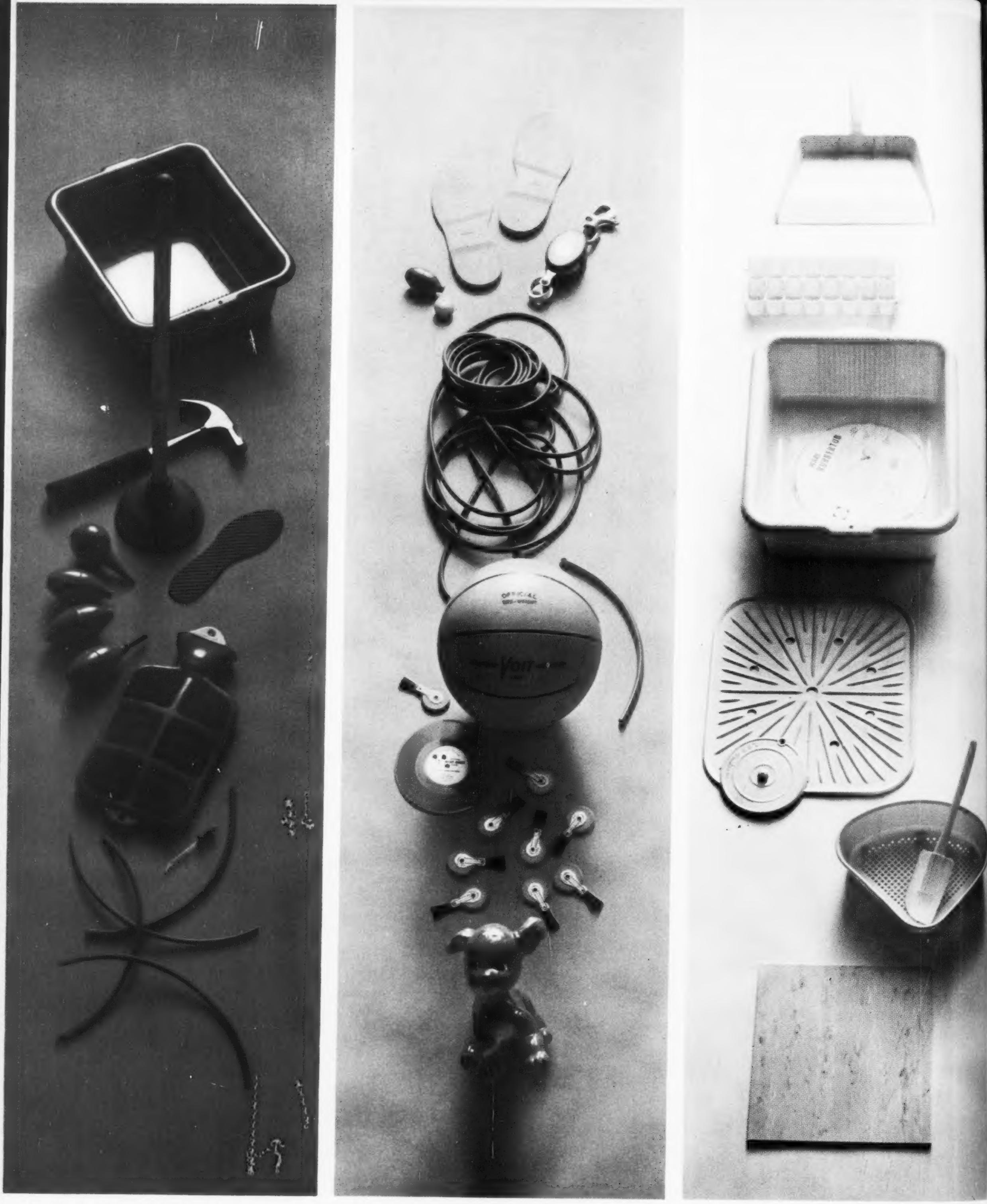


Contact Columbia-Southern for specific information on brand names and availability of any of these quality rubber goods.

HI-SIL®, CALCENE®, & SILENE®
MAKE COLORFUL NEWS IN HUES

Soling t
stair tre
bow of
from C
Hi-Si
helping
spannin
brights
along v
scriptio

COL
A Subs

Photographed by Becker-Horowitz

Soling to syringes, swim fins to spatulas, stoppers to stair treads—and from smoked sheet to silicone—a rainbow of products for bright and dependable service rises from Columbia-Southern white reinforcing pigments.

Hi-Sil, Calcene and Silene are the quality materials helping to make possible the top-grade, spectrum-spanning articles you see above. Subtle pastels, vivid brights, true deep tones . . . they're all obtainable, along with excellent physicals, in goods of every description to meet modern consumer and industrial needs.

Why not re-examine your own product line? Perhaps a brand-identifying color will materially help your sales appeal and profit picture. If you've already gone to color, perhaps some upgrading with these Columbia-Southern pigments is in order. For particular and individual formulation help, just address us at Pittsburgh or the nearest of our fourteen District Sales Offices.

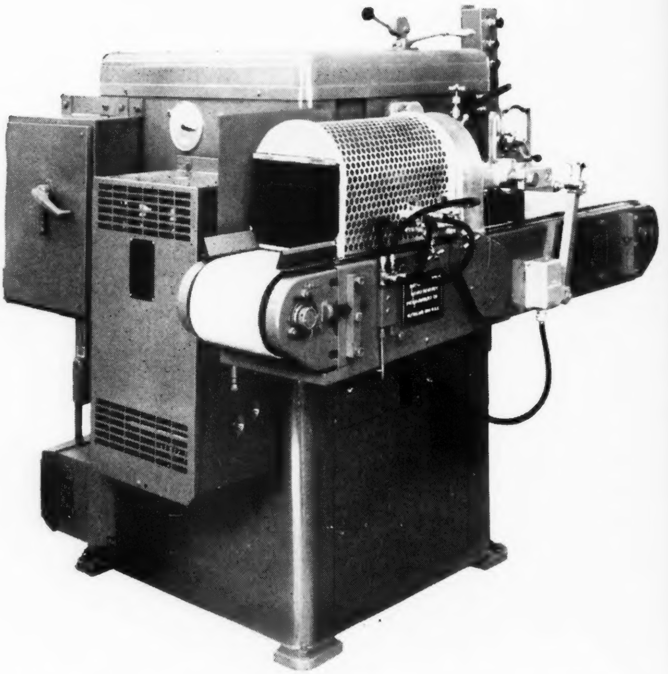
The Columbia-Southern Chemical Corporation, One Gateway Center, Pittsburgh 22, Pennsylvania. Offices in principal cities. In Canada: Standard Chemical Limited.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION

A Subsidiary of Pittsburgh Plate Glass Company

Where speed and accuracy are essential...

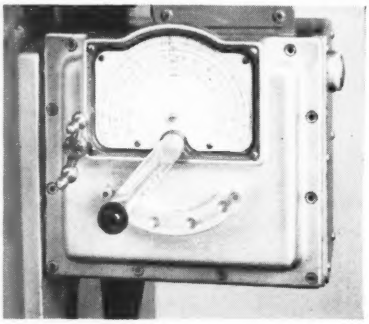
Wink® High Speed Automatic Cutting Machines give faster production, boost profits!



Model M-420 Universal *is a completely automatic machine for both continuous and intermittent cutting. The built-in metering conveyor elements transport the uncut stock to the knives, precisely measure the length of cut and move the cut stock away from the blades. Wink actually* **measures** *while it cuts from four points simultaneously. It does not depend upon timing or synchronization with another unit or machine—does not cut against a dead element but against another live knife.*

WINK high speed Cutters were developed to provide exacting accuracy, tremendous speed and controlled feed to the cutting of a wide variety of materials. These include Rubber (both raw and cured), Plastics, Impregnated Fabrics, Reinforced Hose, Natural and Synthetic Fibres, Ceramics, Candy and other materials. These materials may be cut in diameters up to 3 inches—hot or cold, wet or dry—*without distortion or collapse.*

WINK Cutters are especially suited to the precise cutting to length of extruded materials—may be easily incorporated in a completely automated extrusion line. Cutting action may be continuous or intermittent . . . in lengths up to 60 feet (or more if desired). Materials may be sliced to a mere 1/16-inch length of small diameter stock. Even solid, uncured rubber 2 inches in diameter can be cut to 1/8-inch lengths at rates up to 1000 pieces per minute.



This newly-designed, finger tip controlled metering unit provides three intermittent cutting ranges —enabling selection of lengths from 1/2-inch to 60 feet. Scale is graduated in feet and inches which makes for precise, rapid setup—simple to operate. (Patent Pending)

WINK Cutting Machines Reduce Production Costs 7 ways

1. Speeds up to 1500 per minute without distortion or collapse (3000 or more on some applications);

2. Setup Time in minutes (average time is 5 minutes per job);

3. Scrap reduced as much as 90% over traditinal methods; *No* recurrent loss of end stock; Material is saved by cutting *to exact dimensions;*

4. Secondary operations often eliminated;

5. WINK cuts "on the fly"— right off the conveyor belt, (within inches of the extruder plate if desired);

6. Cuts Hot, Cold, Wet, Dry or Sticky Materials exactly—*without distortion;*

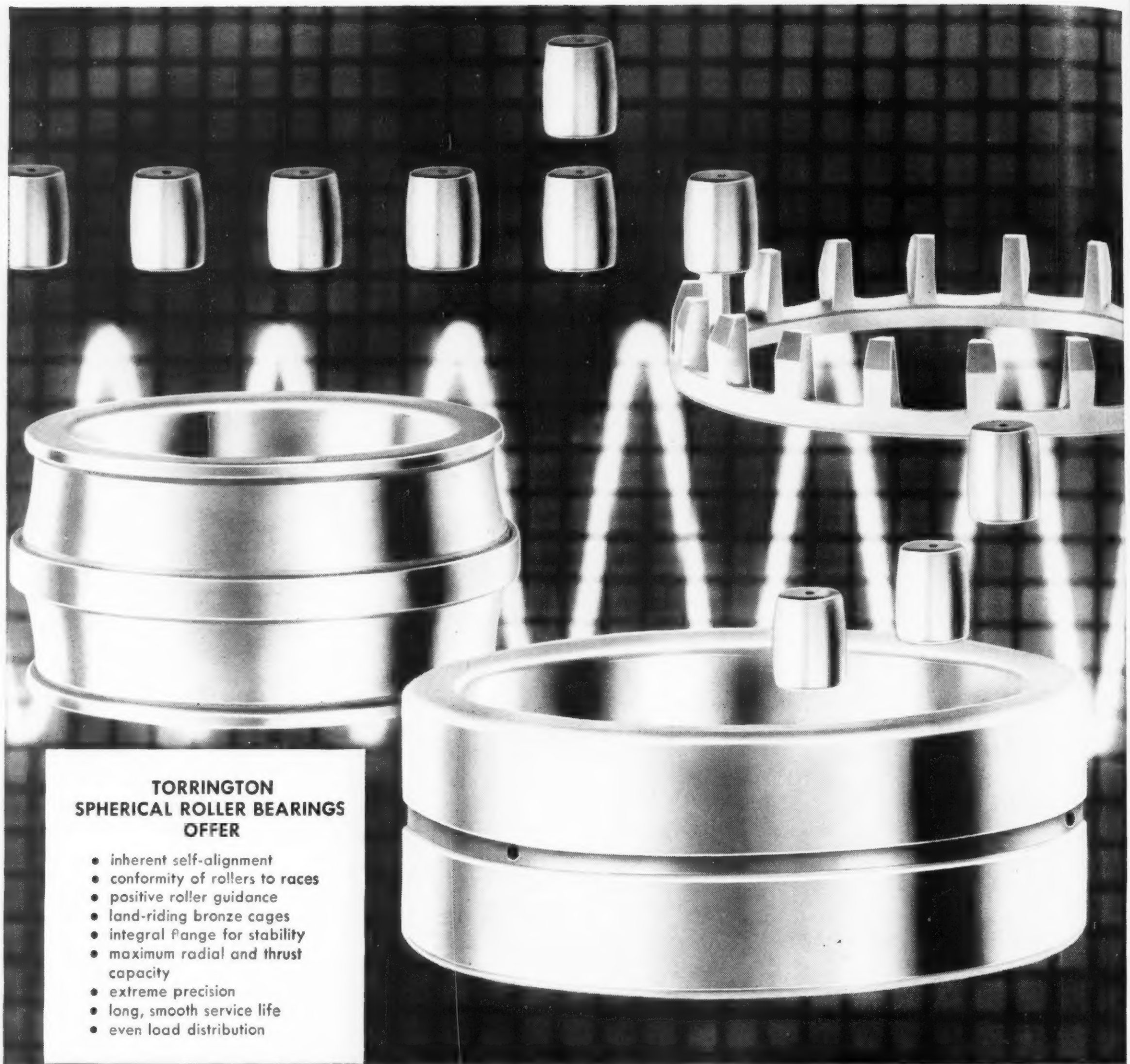
7. WINK cuts even delicate, uncured shapes without collapsing—eliminates filling or internal lubrication of materials.

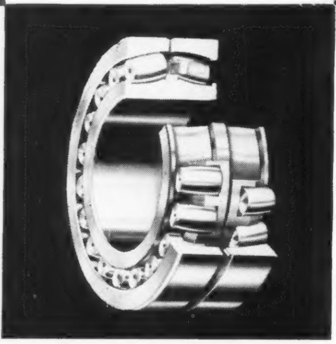
Remember, Wink Cutters are available on Lease, Lease-Purchase or Time Payment plans to help cut your extruded material faster, more accurately and without any distortion. They're designed by a highly skilled engineering staff and produced in one of today's most modern manufacturing plants using the finest in production, tooling and quality control methods.

Write today for your free copy of Wink Bulletin W-100. It contains engineering information on the complete Wink Cutter line.

MOTCH AND MERRYWEATHER

WINK CUTTER DIVISION
1250 E. 222nd Street
Cleveland 17, Ohio





Send for the new Torrington Spherical Roller Bearing Catalog #258

Electronics Matches Rollers and Races for Extreme Accuracy

Torrington employs the latest electronic techniques to insure precise geometric relation between components of Torrington Spherical Roller Bearings.

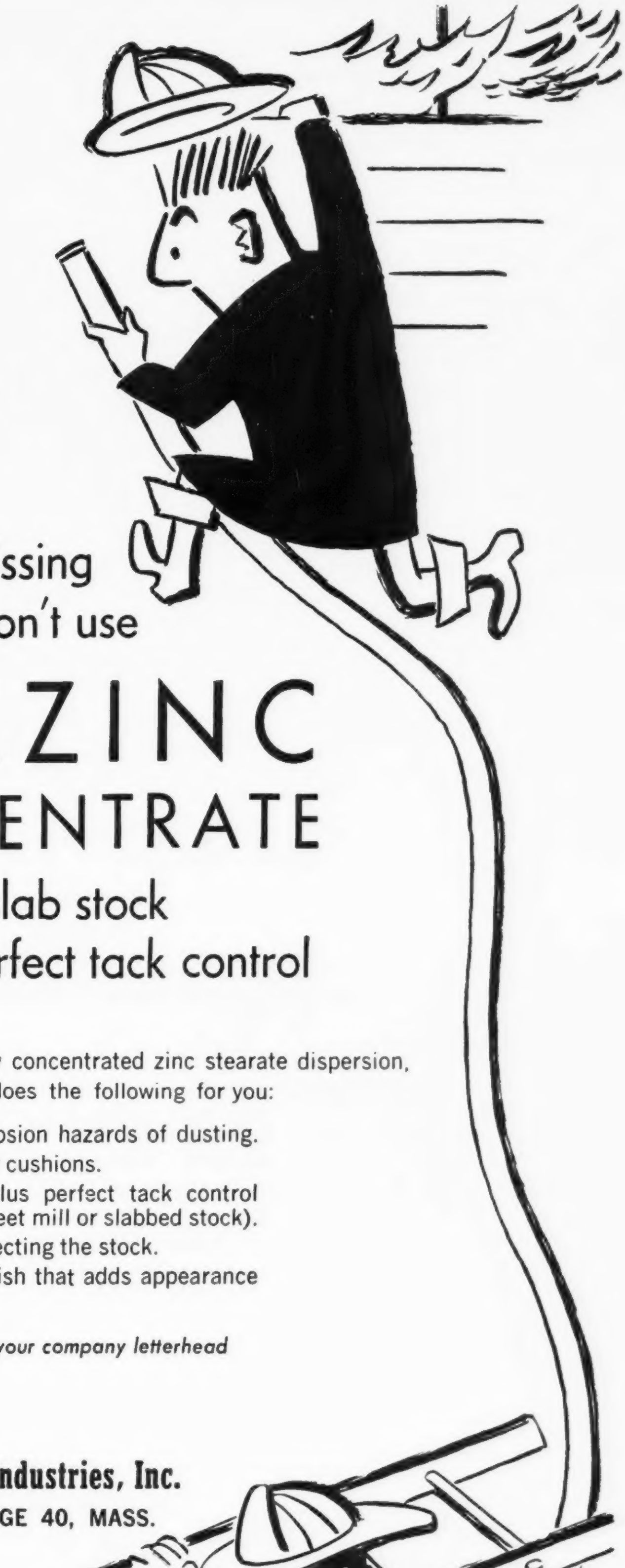
Roller diameters of a given complement are matched within .0001″ of each other. For ultra-precision bearings, tolerances are even closer. Inner and outer races are as rigorously classified. Components are selected for assembly to provide accurate diametrical clearance. The result is bearings of unparalleled accuracy for minimum wear and friction, smooth operation and long service life.

Torrington's care for these details of accuracy is matched only by our care in matching the *right* bearing to the *right* job. In this, you can rely on your Torrington representative and the facilities of Torrington's Engineering Department. **The Torrington Company, South Bend 21, Ind.—and Torrington, Conn.**

TORRINGTON BEARINGS

District Offices and Distributors in Principal Cities of United States and Canada

SPHERICAL ROLLER • TAPERED ROLLER • CYLINDRICAL ROLLER • NEEDLE • BALL • NEEDLE ROLLERS • THRUST



NEW PRODUCTS

Supreme Vinyl Flooring by Goodyear

A complete new line of economy all-vinyl flooring, called Supreme, has been introduced by the Goodyear Tire & Rubber Co., Akron, O. Shown for the first time at the Winter Merchandise Mart in Chicago, Ill., the new 0.080-gage line for residential or light commercial application was a main attraction in a display of Goodyear vinyl and rubber flooring products.

Produced in nine-by nine-inch tile form only, the line consists of 20 light, popular decorator colors in four patterns. Color styles and patterns available include eight in terrazzo, five in romance, a plain black or white, and five in metallic.

The styling and decor seen in the Supreme patterns are the results of the new patented manufacturing process which was revealed at the introduction of the initial NoScrub line at last year's winter market.[1] The process is said to involve an intricate annealing of a heavy-duty vinyl, reverse printed, to a quality vinyl backing.

The new Supreme line will be sold with a home owner's guarantee against wearout during lifetime occupancy. First dealer shipments were scheduled for January, together with descriptive literature which includes installation and maintenance specifications.

[1]See Rubber World, Mar., 1958, p. 926.

Lee Powerseal Battery

The Lee Tire & Rubber Corp., Conshohocken, Pa., has introduced an all-new and simplified line of Lee Powersealed batteries for passenger cars, heavy duty truck, commercial and marine use; available in either 6-volt or 12-volt models, wet or dry charged. The exclusive Lee feature from which the battery derives its name is Powerseal, the active material which coats the grids with silver and cobalt to protect against grid corrosion and power-loss.

The specially compounded alloys of the Lee True-Cast Grids also help resist corrosion and failure. The metal has been refined to reduce the harmful trace elements that attack the metal and help break down the grids.

Other features of the batteries include a hard rubber one-piece case, said to be 20% stronger and capable of absorbing jolting shocks and vibrations; bonded construction between the post and the cell cover and Superflow plastic bound separators which are extremely porous, permitting faster circulation of the acid and decreasing electrical resistance.

The Spotlite vents make it easier to locate the water or electrolyte, speeds servicing and reduces the possibility of acid spillage. There is always a reserve supply of electrolyte stored in the 62% extra storage area above the plates.

Full information on the new simplified line of Lee Powersealed Batteries is contained in Catalog C-422 which may be obtained from the advertising department of the manufacurer.

Steel-Cord Tire by Firestone

A new steel-cord, one-ply truck tire said to give twice the mileage on drive wheels as compared to tires of textile cord construction has been announced by The Firestone Tire & Rubber Co., Akron, O. Backed by engineering and development accomplishment in steel-cord tires, dating from 1938, and more than five million test miles, the new Firestone Steelcord W-2 has (1) double the original tread mileage on drive wheels, (2) operates up to 100 degrees cooler, (3) provides 25% reduction in power loss, (4) has load-carrying capacity equal to extra ply rating textile tires, (5) offers better traction because of larger and longer footprint, (6) provides softer ride to reduce equipment maintenance costs, and (7) provides greatly increased resistance to impact and punctures, the manufacturer claims.

Step-down section of Steelcord W-2

The W-2 Steelcord tire has only one ply, running from bead to bead at a zero angle, with the running area fortified with up to five bands of steel cords in the crown area. These five bands restrict tread movement, increase tread life, improve traction, reduce power loss, and tire running temperatures, and prolong the original tread life, permitting many additional retreads.

Thirty-nine high-tensile Swedish-type filaments (0.0058-inch) are twisted to form a single cord in this tire. New processing equipment, including molds and tire assembly machines, were necessary to produce these tires. Also, eight new rubber compounds were developed and incorporated in the construction of this tire.

The new Steelcord W-2 tire is available in four sizes: 8.25-20, 9.00-20, 10.00-20, and 10.00-22.

Ray-Man Conveyor Belt

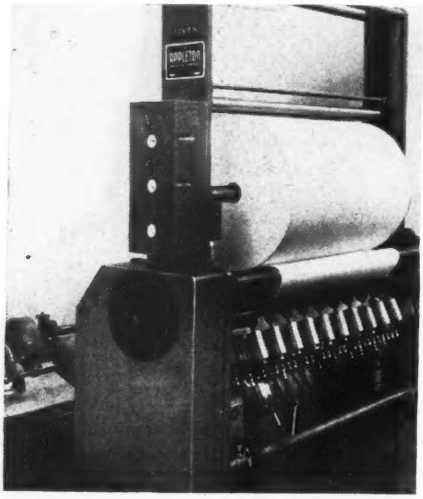
Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J., is marketing a new Ray-Man conveyor belt, which has a special compensation feature aid to provide bending stress relief of its outer ply when flexing around a pulley. Because the outer ply is relieved of excessive strain, the belt is better able to absorb the strain and impact of loading, while also pulling its weight as a strength member and protecting the inner plies of its construction.

Some other advantages claimed for the belt include: greater flexibility and troughability; high resilience to absorb shock loading; long vulcanized splice life; high resistance to cuts and tears; excellent adhesion of covers to strength member; mildew-proof—may be made fireproof; and cost savings in operation. Tough nylon in the resilient outer ply absorbs shock, distributes impact resistance equally over a wider area, and protects the inner plies. High impact resistance also adds to the belt's ability to withstand wear, abrasion, and tearing. It is claimed that no breaker fabric is required with this construction; thus more thicknesses of the cover is utilized.

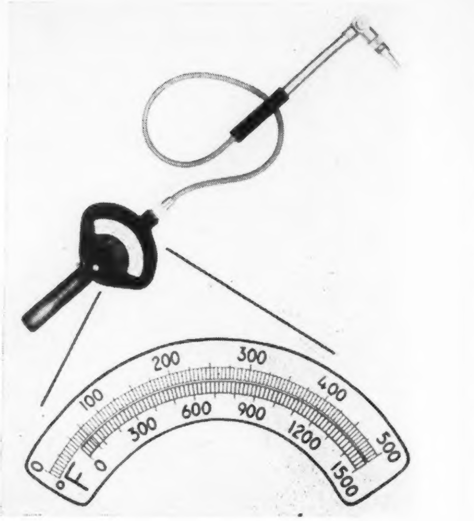
Excellent troughing and training of Ray-Man—even when empty—is claimed because the belt provides the high degree of lateral flexibility needed for complete center roll contact. This feature enhances its use for both standard 20-degree idlers and the newer 45-degree idlers with their increased load-carrying capacity.

Further information and a brochure describing this belt are available from the company.

NEW EQUIPMENT



Doven SR-60 Slitter



Model DR35 double-range pyrometer

Model DR35 Pyrometer

Appleton Machine Co.'s Doven division has introduced a new and improved score or shear cut slitter. The new machine is capable of slitting paper, paper-board, coated fabrics, textiles, rubber, and sponge rubber as narrow as ¼-inch. New features of the machine include: Doven shear-cut principle which permits an inexperienced operator to reassemble cutter blades to 0.001-inch tolerance; exclusive air operated cutters—for easily adjusted equalized pressure; exclusive air cylinder-operated rider pressure roll said to eliminate the need of counter-weights and chains; leaf-spring feature on manual-operated cutter; and automatic roll tension control.

Other features include all-steel construction; mill roll stand on standard model having manual edge guide and tension control; pushbutton inching; a feed roll feature which reduces tension on parent roll stand and provides uniform tension for slitting operation; sealed ball bearing throughout machine; and a variable-speed drive.

The machine's specifications follow: web sizes vary from 36 to 125 inches wide; parent roll capacity, 48 inches (optional equipment increases capacity to 60 inches); and an optional automatic web guide and constant tension device. The new slitter can be equipped with virtually any type of electrical or mechanical drive for a variety of applications. Additional information can be obtained from the Appleton Machine Co., Appleton, Wis.

Model DR35 Pyrometer

The Pyrometer Instrument Co., Inc., Bergenfield, N. J., has developed a new Pyro double-range surface pyrometer—claimed to be the first truly accurate and versatile instrument designed for all precision temperature measurements in plant and laboratory alike.

The new Model DR35 Pyro surface pyrometer can measure both surface and subsurface temperatures. The long 4¾-inch indicator has two clear and distinct scale ranges in different colors; the low range from 0-500° F. is drawn in black and is subdivided into easily read 5° division; whereas the high range is calibrated in contrasting red from 0-1,500° F. Temperature readings on both scales can be easily interpolated to within a fine fraction of each division. The range selector switch is conveniently located to permit the operator to change from one scale to the other by a flick of a finger.

Featuring the exclusive Pyro Compensator, the meter automatically corrects itself for changes in room temperature on both scales and assures an accuracy of 1½%. It is available with a wide selection of 15 different types of interchangeable thermocouples as well as flexible and rigid extension arms.

By combining two temperature ranges on one instrument, the Pyro Model DR35 can offer the high accuracy and readability expected for low-temperature measurements with the added advantage of permitting the instrument to be used for higher temperature problems to 1,500° F.

A bulletin, No. DR35, illustrates and describes this new instrument and is available from the company.

New ATL Test Chamber

Associated Testing Laboratories, Inc., Caldwell, N. J., has announced a new environmental test chamber for low-high temperature testing in the range of −100 to +800° F. The high efficiency of the Freon 13—Freon 22 cascade-type unit can be seen by the high heat dissipation—1,600 BTU/hr. at −85° F., 500 BTU/hr. at 100° F. Accuracy to within plus or minus 2° F. is a feature. Aircooled compressors assure ease of operation, and blower motors are externally mounted for accessibility.

ATL test chamber

Working dimensions are 18 by 18 by 18 inches, an internal volume of 3.4 cubic feet. A multipane window (optional) provides

(Continued on page 760)

TECHNICAL BOOKS

NEW PUBLICATIONS

"Taylor-Stiles 800 Series Cutters." Bulletin No. 217. Taylor, Stiles & Co., Riegelsville, N. J. 4 pages. This new bulletin illustrates and gives the important features of the company's 800 series cutters for dicing plastics and cutting continuous filament. Operating principle and construction data are included.

"United States Testing Co." Bulletin 5801. United States Testing Co., Inc., Hoboken, N. J. 6 pages. This bulletin describes the complete line of laboratory and field testing facilities and services available from this company. Included is a description of its engineering facilities and services, its organic and inorganic chemical laboratory, materials testing, engineering inspection, scientific and commercial photography, textile laboratory, package testing facilities, microscopy, psychometrics, and certification of product quality.

"Latex Accelerator Study: Hevea-SBR 2105 Blends." S-147. Industrial chemicals division, Pennsalt Chemicals Corp., Philadelphia, Pa. 6 pages. The data in this bulletin show that an accelerator which performs well under normal conditions may introduce stability problems if the latex compound has to be stored for any length of time before processing. The data also shows that some very fast accelerators may produce films with severely degraded physicals as a result of excessive precure during extended storage. Procedures, effects on physical properties, and results in tabular form are included in this report.

"Hannifin High-Speed Hydraulic Presses." Bulletin 130-G. Hannifin Co., Des Plaines, Ill. 24 pages. This new bulletin describes the standard line of the company's open-gap and column-type high-speed hydraulic presses. These presses, ranging in capacity from one ton to 150 tons, can be used for forcing, straightening, trimming, molding, bending, and press-fit assembly operations. The bulletin covers the features, specifications, and dimensions for the standard line along with a section containing engineering formulas useful in selecting the proper press for a specific application.

"Continuous Flowmaster Reactor." Bulletin FR-58. Baker Perkins, Inc., chemical machinery division, Saginaw, Mich. 4 pages. Typical applicable heat transfer calculations, laboratory and testing facilities available for researching new applications—in connection with a new continuous reactor which combines continuous mixing with accurate process temperature control—are detailed in this folder. It describes construction, sizes, and capacities available and other engineering features. It also includes suggested applications in the food, textile, pharmaceutical, petroleum, and chemical industries.

"'Super-Seal' Open-Type Motors." Bulletin 05-51B9040. Allis-Chalmers Mfg. Co., Milwaukee, Wis. 6 pages. The firm's "Super-Seal" open-type motors suitable for many applications previously requiring enclosed designs are described. Available in all integral horsepower frames, the motors are unaffected by moisture, dust, dirt, oils, acids, and alkalies, it is claimed. The motors have an encapsulated stator design in smaller sizes and "Silco-Flex" insulation in larger sizes, both of which result in maximum protection. An example of how the motor saves 30% on a typical pump drive is given in this bulletin.

"Huber Aerfloted Clays for the Rubber Industry." J. M. Huber Corp., New York, N. Y. 12 pages. The data shown in this bulletin demonstrate not only three distinct types of Huber clays (Suprex Clay, Paragon Clay, Hi-White R Clay) at four different loadings, but also show how these grades can be distinguished. Graphs are given which point out the differences among these clays on tensile and tear resistance properties. These graphs also demonstrate the effects of increasing loadings of these clays.

"Insular Vinyl Polymers and Copolymers." Rubber Corp. of America, Hicksville, N. Y. 24 pages. This new spiral-bound reference book introduces the company's vinyl chloride polymers and copolymers. Following a general introduction, the text is divided into four sections, the first and second of which include technical specification sheets and application recommendations. The next section is titled, "Compounds with Insular Polymers," and is followed by a description of the test methods used for resin evaluation.

"Geon and Good-Rite Polyblend Compounds." Bulletin G-17. B. F. Goodrich Chemical Co., Cleveland, O. 20 pages. This report presents a summary of the company's Geon and Good-Rite compounds, their processing, and applications for the extruded sheet market. Five rigid thermoplastic compounds for use in extruded sheet are currently available as small cubes of uniform size. They can be divided into three types by composition: polyvinyl chloride, polyvinyl chloride copolymers, and acrylonitrile-butadiene-styrene.

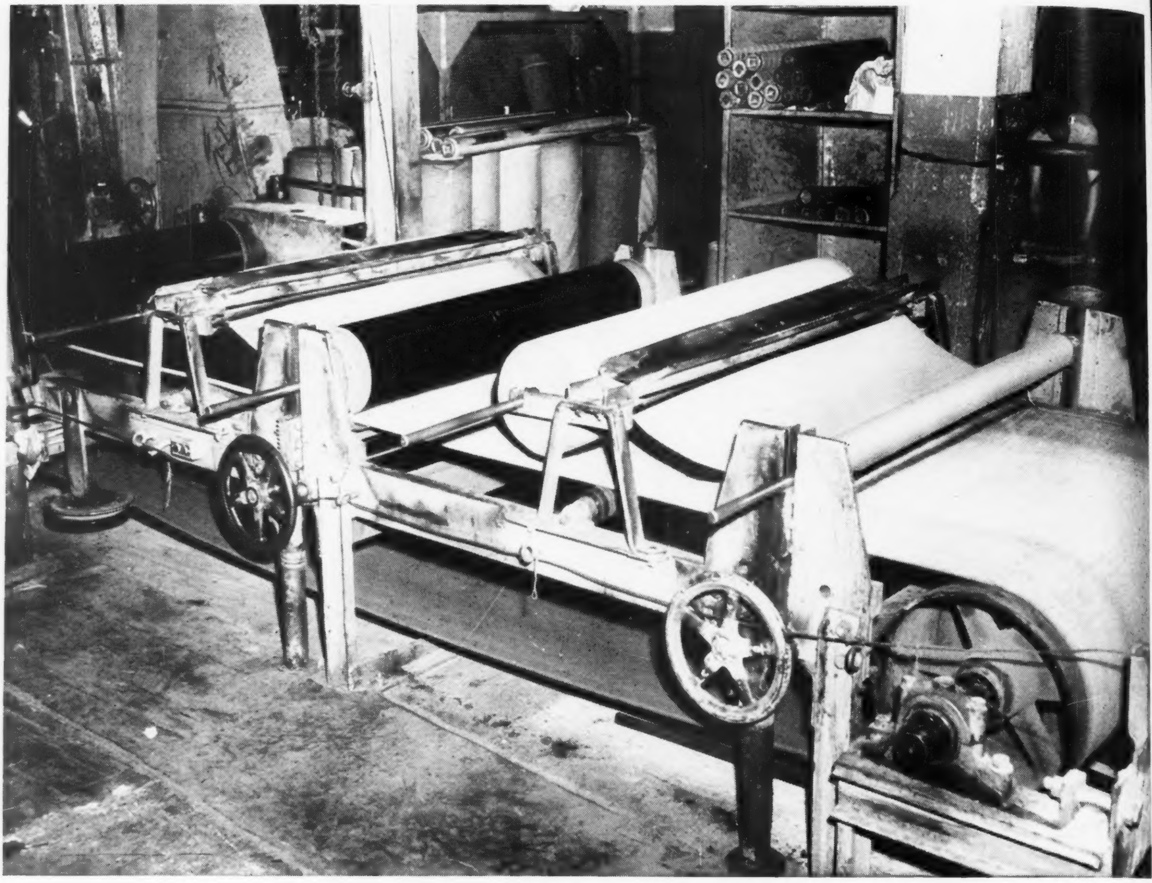
"1959 Guide to Dow Corning Silicones." Dow Corning Corp., Midland, Mich. 16 pages. This complete reference to the company's silicones describes and illustrates many ways to cut production costs, simplify designs, improve performance and sales appeal to products. Some topics covered include mold release agents, adhesives, defoamers, polyurethane foam additives, Silastic RTV, and Silastic silicone rubber.

"Custom Scientific Instruments Catalog No. 59." Custom Scientific Instruments Inc., Kearney, N. J. 12 pages. This new catalog contains illustrations and brief descriptions of 60 different testers or equipment manufactured by the firm as standard products. The testers and equipment are used in the following fields: adhesives, cement, calibration, insulation, metals, paper, plastic, rubber, textiles, and fats-wax.

"Rubber Industry Tools." Bulletin No. 571. Cowles Tool Co., Cleveland, O. 48 pages. This new and comprehensive catalog contains information on the firm's skiving knives, bias cutting knives, calender knives, debeading knives, circular cutting knives, and other standard and special types of rotary knives and special tools used in the rubber industry. Illustrations are included.

"C-4019-S, C-4020-S, C-4021-S 'Silicol' Silicones Rubbers." Colonial Rubber Co., Ravenna, O. 3 pages. These data sheets actually are three separate reports on three silicone rubbers, all of which are quite similar in properties, but differing in durometer hardness. C-4019-S "Silicol" is a 50-durometer silicone rubber having good tear resistance and excellent compression set properties. It has good oil resistance, low water absorption, and excellent mechanical characteristics. It meets Government Specification MIL-R-5847-C, Class II 50 Durometer, MIL-R-3065-B (MIL-STD-417) TA-505, ASTM D 735, and TA-507. C-4020-S is a 70-durometer silicone rubber with low water absorption characteristics and excellent mechanical properties. It meets MIL-R-5847-C, Class II 70 Durometer, and AMS 3357 specifications. C-4021-S, an 80-durometer silicone rubber, has good tear resistance, excellent compression set properties, low water absorption characteristics, and good mechanical properties. It meets MIL-R-5847-C, Class II 80 durometer, and ASTM TA-806, E, E1, E3, and L., MIL-R-3065-B (MIL-STD-417) TA-505, ASTM D 735, and TA-507. All three silicone rubbers are recommended for general molding such as for seals, gaskets, and special shapes, plus a wide variety of other industrial uses, including applications in aircraft and missile manufacturing. Vulcanizates are useful for service from —65 to 500° F.

(*Continued on page 763*)



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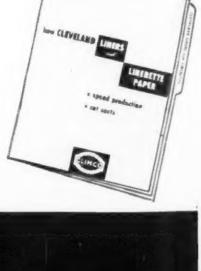

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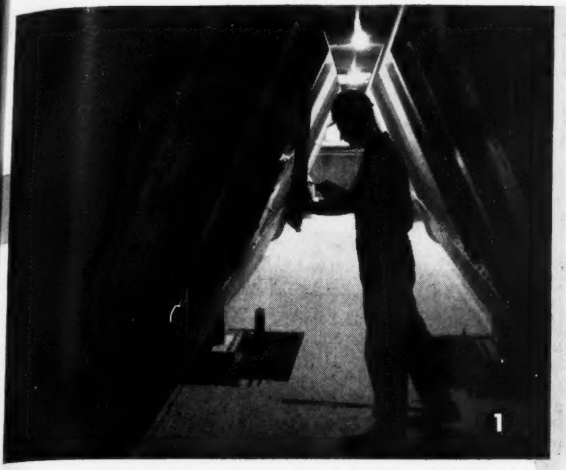
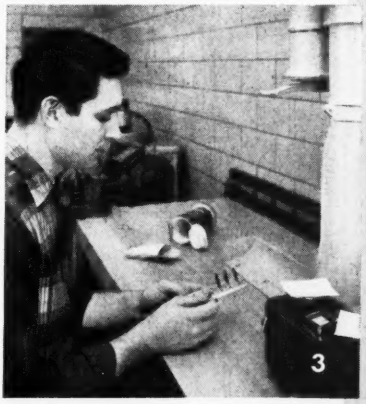


1 Huge zinc oxide collecting hoppers are the final stage in St. Joe's continuous oxide smelting process. Here Plant Technical Superintendent Chuck Bugher draws off an oxide sample and takes it to . . .

2 . . . the sample preparation room. There 4 cc. of the oxide sample is sealed in a small envelope and put in a pneumatic tube carrier. In less than one minute the Lamson airtube system delivers the sample to . . .

3 . . . the Direct Reading Spectrometer Laboratory. Analyst Dick Halfhill thoroughly mixes equal weights of oxide and electrically conductive graphite and makes test electrodes by packing the mixture into four metal tubes as shown above. These electrodes are taken to an adjoining room housing . . .



4 . . . the Baird DR Spectrometer. Two specimen electrodes are properly spaced in the spectrometer's holders, the door is closed, a button is pushed and extremely high voltage creates an arc across the electrodes. As elements are burned, light from the arc is broken into element lines of varying light energy. This energy directed to photomultipliers (photosensitive electronic tubes) is converted to electrical energy which actuates . . .

5 . . . pre-calibrated dials that read elements present DIRECTLY IN PERCENTAGES. In five minutes, four specimens can be completely analyzed for copper, manganese, lead, iron, silica, cadmium, indium, aluminum and silver. The four analyses are averaged out and entered on the specimen report. Two minutes later via return air tube . . .

6 . . . Superintendent Bugher knows the exact nature of in-process zinc oxide. TOTAL ELAPSED TIME FROM COLLECTION OF SAMPLE—**16 MINUTES!** Changes in the smelting phase, if any are required, can be made immediately — impure oxide destined for reprocessing is held to an absolute minimum **— nothing but oxide of the highest obtainable quality reaches the packing stations.**

RLD

NEWS of the
RUBBER WORLD

President Eisenhower's 1960 budget proposal for a fuel tax hike to 4-1/2¢ a gallon, including increase to 9¢ a gallon on gasoline, has aroused vigorous business and Congressional opposition. Highway Users Conference, representing auto, oil, rubber, transport industries, is organizing protest campaign, and House Speaker Rayburn feels states should have that field of taxation, or what is left of it.

The President's 1960 budget also indicates a drop in natural rubber stockpile maintenance net cost in 1960 fiscal year to \$6.1 million from \$8.5 million in fiscal 1959. General Services Administration confirmed in a December report to Congress that the recently reduced mobilization period of three years has produced stockpile "excesses" of rubber.

Hearings on business practices will continue in the 86th Congress. Senate Small Business Subcommittee will concern itself with complaints of independent tire dealers; Senate Judiciary Subcommittee, with the "Good Faith" bill; Sen. J. C. O'Mahoney, with his premerger notification bill; and a host of other marketing practices bills is on tap.

H. E. Humphreys, Jr., U. S. Rubber chairman, Harvey S. Firestone, Jr., Firestone chairman, and E. J. Thomas, Goodyear chairman, all predict record dollar sales volume for the rubber industry in 1959. W. O'Neil, General Tire president, expects 1959 to be a good year for General Tire, the rubber industry, and the nation.

Capital expenditures for new plants and equipment in 1959 will amount to \$30 million by U. S. Rubber and \$37 million by Goodyear. Firestone spent \$37 million in 1958, but has not indicated its 1959 outlay for these purposes. General Tire is building a multi-million-dollar tire plant in 1959.

Thermoid Co. became a division of H. K. Porter Co., Inc., by action of the respective boards of directors of these companies. Porter had previously acquired Quaker Rubber Co. so that the combined facilities of these two rubber products companies provide Porter with a broad range of industrial rubber items.

RUBBER WORLD

EDITORIAL

Decision on Coordination of 1959 RMA and IRC Publicity Urgent

RUBBER WORLD recommends again that rubber industry management include in the stepped-up public relation program of its Rubber Manufacturers Association, coordination with the publicity activities of the International Rubber Conference, scheduled for Washington, D. C., November 9-13 of this year.

The suggestion was made in this column in August, 1958, that rubber industry management through the RMA organize a "Rubber Progress Week" during 1959 to provide a greater degree of understanding of the industry by its customers, employes, shareholders, and the public in general. In view of the plans of the International Rubber Conference Committee to publicize the most recent achievements of science and engineering as related to rubber in connection with this November, 1959, meeting, a separate or coordinated effort by the RMA in 1959 to provide information on rubber products and their uses, industry economics, and how the industry and its products are involved in the daily lives of almost everyone in this country would seem to have merit. It is quite likely that the 1959 public relations programs of the IRC and the RMA could be arranged to complement each other to the distinct advantage of each.

As a result of the August, 1958, editoral, RUBBER WORLD was advised that the RMA public relations committee would keep the International Rubber Conference matter under continuing review and would support the Conference committee's objectives in every possible way. It was indicated, however, that the RMA public relations program, as conceived in the second half of 1958, was much broader in scope than what might be accomplished in a "Rubber Progress Week," and that of even greater significance was the need of substantial improvement in rubber industry earnings before undertaking any large public relations program.

In view of the improvement in general as well as rubber industry business conditions since 1958 and the optimism of rubber industry leaders regarding record sales in 1959, there should be a better chance that adequate funds for a broad public relations program could be made available. Certainly the advantages of associating some of this RMA public relations activity with the "built-in" publicity to be derived from the 1959 International Rubber Conference should warrant serious consideration.

Mention of some of the subjects to be covered at the International Rubber Conference should help to explain what is meant by "built-in" publicity available to the RMA public relations committee. Such things as Global Developments in Tire Production, New Processing Techniques for the Sixties, International Road Testing of Carbon Blacks in Tires, Quality Control for the Rubber Industry, are examples of the more than 70 subjects being discussed that can be used by the IRC and the RMA to further the understanding of the public in the field of the engineering and scientific accomplishments of the industry.

If there is to be any degree of coordination between the RMA public relations program and that of the International Rubber Conference this year, a decision should be made in the near future.

R. G. Seaman

EDITOR

RUBBER WORLD

Molding of Prepolymer Based Resilient Urethane Foam[1]

By R. E. KNOX
E. I. du Pont de Nemours & Co., Inc., Elastomer Chemicals Department, Wilmington, Del.

Roger E. Knox

The Author

Roger E. Knox, development chemist, elastomer chemicals department of E. I. du Pont de Nemours & Co., Inc., received his B.S. in chemical engineering from Tulane University in 1951. He was employed by the Du Pont organic chemicals department in 1951 in the plant's technical division until 1953 when he was transferred to the engineering division at Jackson Laboratory. In 1956 he was moved to the elastomer chemicals department in the elastomer laboratory. He is presently engaged in machine applications and development work relating to flexible and rigid polyurethane foam.

Mr. Knox is a member of the American Chemical Society and the American Institute of Chemical Engineers and of the executive committee of the Delaware Council of Engineers.

RESILIENT urethane foam is rapidly becoming an established member of the cushioning material family. The outstanding characteristics of this material are its versatility and economy. It is versatile, since articles of a desired form or size can be made by molding directly during the foaming reaction, or they can be shaped from slab foam. Its outstanding load bearing properties, combined with low density, make this material economically attractive. These two facts have led to a comparatively rapid acceptance of urethane foam by the automotive and furniture fields.

A considerable amount of published literature[2-8] is now available on both the chemical and processing aspects of prepolymer based resilient urethane foam. The fashioning of a foamable material into finished products by molding, though a long-established operation in the rubber latex industry, represents a new method of processing urethane foam.

The elastomers laboratory of the Du Pont company for some time has had an active program devoted to the study of urethane foam molding. The initial phase of this work was covered in a paper presented

[1] Presented before the Division of Rubber Chemistry, A.C.S., Chicago, Ill., Sept. 11, 1958. Contribution No. 144 of Du Pont's elastomer chemicals department.
[2] R. H. Walsh, "Automotive Engineering with Urethane Foams," RUBBER WORLD, 136, 386 (1957).
[3] R. G. Arnold, J. A. Nelson, J. J. Verbanc, "Organic Isocyanates—Versatile Chemical Intermediates," *J. of Chem. Education*, 34, 158 (1957).
[4] B. A. Dombrow, "Polyurethanes," Reinhold Publishing Corp., New York (1957).
[5] G. T. Gmitter, E. E. Gruber, "Effect of Ratio of Diisocyanate Isomers in Polyurethane Foams," *SPE Journal*, Jan., 1957, p. 27.
[6] J. H. Saunders *et al.*, "Properties of Flexible Urethane Foam," *Chem. and Eng. Data Series*, April, 1958, p. 153.
[7] R. J. Ferrari *et al.*, "Compounding Polyurethanes," *Ind. Eng. Chem.*, July, 1958, p. 1041.
[8] "A Trouble Shooter's Guide for "One Shot" Foam," *Resin Review, Vol. VII, No. 3,* Rohm & Haas, Philadelphia, Pa.

Molding of Prepolymer Based Resilient Urethane Foam

Resilient urethane foams are becoming increasingly more important as cushioning materials for the automotive and furniture industries. Articles of desired shapes and sizes can be made by molding to shape during the foaming reaction, using a predetermined mold. They may also be postformed from slab foam by contour cutting or heat forming operations.

Advances in processing methods, particularly in molding, have kept pace with the marked improvements in urethane foaming systems. A brief review of the fundamentals pertaining to the molding of solid and core items and a discussion of the more important variables involved are given.

The methods developed for eliminating some of the difficulties and deficiencies encountered in earlier molded articles of urethane foam, such as, skin coarseness, cellular irregularity, nonuniformity of density, hard edges, surface marking, pneumaticity, and slow recovery from deformation, are discussed. In addition, the important economic factors that enter into any comparison of the relative merits of molded *versus* slab production, such as density and scrap losses, are reviewed.

in Minneapolis, Minn., October, 1957.[9] At that time, information was presented on the variables controlling molding, and the equipment required for continuous processing. This work also showed the molding of resilient urethane foam to be a reproducible unit operation.

This paper is concerned with recent progress which has been made in molding, particularly in eliminating defects in molded objects. In addition, the physical properties of these molded foams are compared to those made in slab form. Finally, the effects of core molding on finished article weight and physical properties will be discussed.

Porous Surface Molded Foam Preparation

The skin or surface of most molded urethane foams in the past has been substantially non-porous. This type of surface has been found to be responsible for a number of molded foam defects such as surface marking, pneumaticity, and slow rates of recovery. These defects may be eliminated by preparing foams having a porous surface. Such surfaces are readily obtained by brush or spray coating the mold with selected surface active agents prior to mold filling. A number of these agents varying widely in chemical composition can be used. Methyl silicone solution[10] alone or in combination with paraffinic-type mold release agents was used in preparing the foams which will be discussed in this paper.

The mechanism by which the surface-active agents act to yield porous foam surfaces has not as yet been completely defined. It is theorized, however, that as a result of this surface treatment, a gross change of the surface tension of the foaming mass occurs at the mold surface-foam interface. This results in localized "permanent rupturing" of the thin surface film, exposing the open celled network of the main foam body.

It is essential that the treating chemical's activity be confined to the foam surface only; otherwise excessive surface collapse results, leading to formation of the characteristic film-type skin. Solution strength and coating thickness are effective methods for controlling the surface-active agent's activity. The open celled surface of treated molded foam, compared to regular molded foam, is graphically illustrated by means of photomicrographs shown in Figure 1.

Molded Foam Porosity Measurement

The porosity of foam which has been formed against a treated surface has been compared with conventional molded foam as well as with cut slab foam, in Table 1. These data show that surface treated foam is superior to untreated foam and is equivalent to slab cut foam. Foam permeability was determined using a Gurley-Hill porosity tester.[11] This tester measures the time required to pass a given volume of air through specimens of fixed cross-sectional area and thickness. Tests were run in accordance with TAPPI[12] T460 M-49. Although this method has been developed for testing the air resistance of paper, it has proved of value in determining the relative porosities of foam.

Foam Surface Marking

When a relatively high load per unit area is applied to conventional molded urethane foam surfaces, the surface undergoes permanent deformation. This surface "mark" is left long after the load is removed. Figure 2 shows typical surface marking on conventional molded foams. Although surface marking does not materially affect molded foam utility, it does detract from its appearance. Surface marking may be greatly minimized simply by covering the foam with

[9] R. E. Knox, W. J. Touhey, "Molding of Resilient Urethane Foams." Presented before Isocyanate Symposium, Upper Midwest Section Society of Plastic Engineers, Minneapolis, Minn., Oct. 8, 1957.

[10] DC-20, Dow Corning Corp., Midland, Mich.

[11] Softness, porosity, and smoothness tester (S.P.S.), W. & L. E. Gurley, Troy, N. Y.

[12] Technical Association of the Pulp & Paper Industry, New York, N. Y.

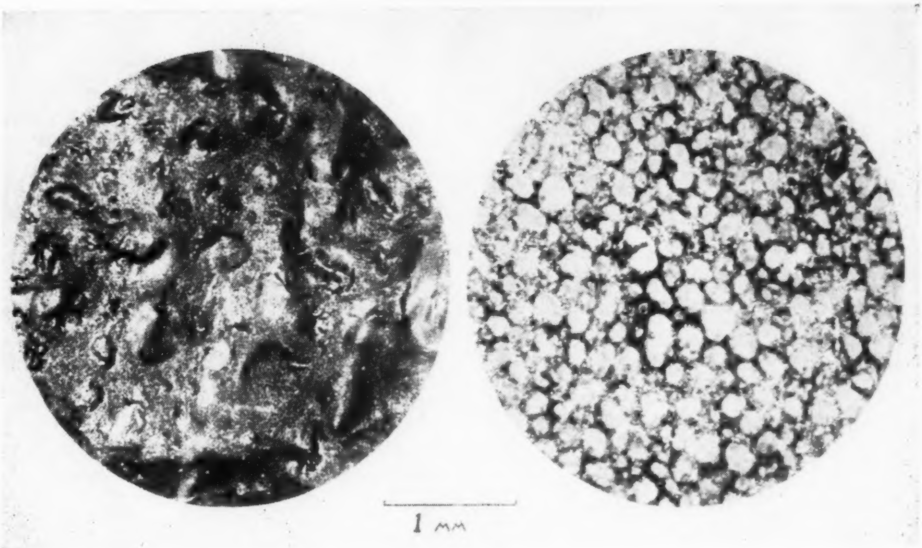


Fig. 1. Photomicrographs of regular *(left)* and treated surface *(right)* molded resilient urethane foam. To decrease light transmission and reflection, the surfaces were ink stained. The regular foam exhibits a continuous surface with no observable openings leading into the foam interior. The ink stains on the treated surface foam are concentrated on the cell walls only, and the light areas are the openings leading into the foam interior. Staining on cell walls even below surface, indicative of ink penetration through the surface openings, may be observed.

TABLE 1. COMPARATIVE POROSITIES OF REGULAR AND TREATED SURFACE MOLDED FOAM

Sample*	Time Required to Pass 100 Cc. Gas Through Sample, in Seconds
Slab foam	4
Molded Foam	
Treated surface	4
Regular surface	10

*Sample size, 2 x 2 x 1/4-inch.

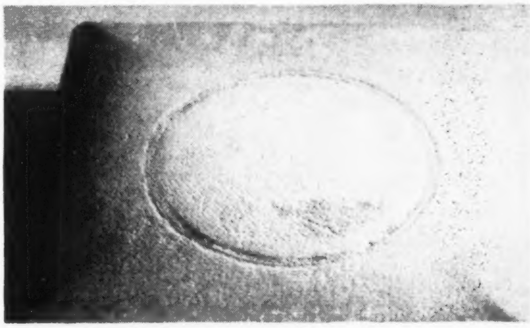


Fig. 2. This annular surface mark, approximately 1/64-inch in depth, on regular molded resilient urethane foam, is the result of a 3-psi. load applied for 72 hours. The photograph was taken one hour after load removal, and no further change in surface recovery was observed after 90 days.

fabric which tends to distribute any concentrated load which may be applied to the foam. This solution, however, in most instances is unsatisfactory since the majority of foam used for cushioning is sold in the uncovered state. The ability to prepare porous surfaces has largely eliminated surface marking as a major defect of uncovered molded urethane foam.

The suspected cause of permanent surface indentation in conventional molded foam objects, is probably associated with excessive stretching of the surface and exceeding the elastic limit of the surface film owing to the application of concentrated loads involving only a small area of the foam's surface. This point is best illustrated in Figures 3 and 4. By applying a concentrated load, a small area of the foam is deflected to 50% of its original height. Examination of the nature of this deflection shows that essentially 100% cell deflection occurs up to the depth of load penetration. Thereafter cell deflection drops off rapidly to zero for the remainder of the supporting foam column.

Closer examination of undeflected conventional foam shows that there is a limited layer immediately under the surface which is considerably lower in density than the main body of the foam. This is evidenced by large thin walled foam cells in this region. It is believed that this density variation results when the skin is being formed. The skin, being higher in density, has in essence drawn material from the foam cells immediately below the foam surface. Owing to this region of low density, the stretched skin, after load removal, has little or no tendency to return to its original position owing to lack of adequate supporting foam material to aid in its recovery.

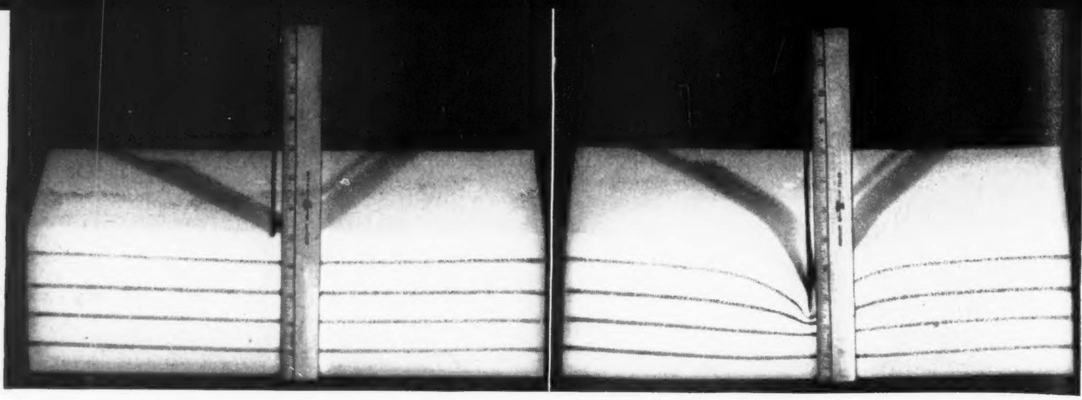


Fig. 3. Undeflected foam *(left)* and foam deflected 50% by application of concentrated load over a small area *(right)*; the latter shows that foam deflection and surface stretching are severe up to depth of applied load penetration. Thereafter deflection drops off rapidly for the remainder of the supporting foam column.

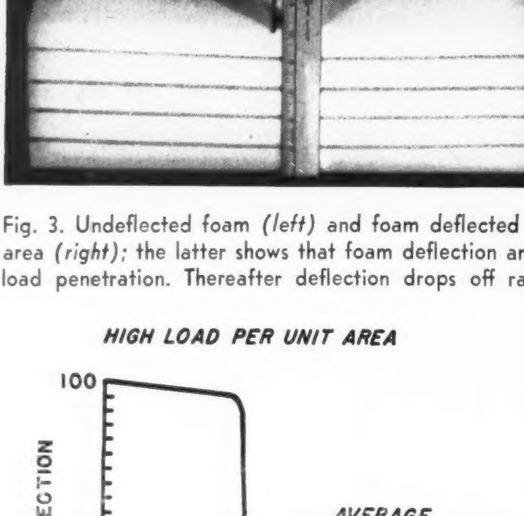


Fig. 4. Deflection of resilient urethane foam with high load per unit area and with load applied on top surface *versus* foam thickness in inches.

The resistance of treated foam to surface indentation is markedly improved over conventional molded foam. This is best shown by means of time sequence pictures, Figure 5. In addition, examination of cut samples of porous surface foam shows that the low density layer immediately under the surface has been greatly minimized.

Surface Porosity and Foam Resilience

Conventional molded urethane articles compared to porous surface foams show significant differences in the rate of deflection and recovery as loads are applied and removed. These differences are dependent to a considerable extent on the rate at which air leaves and enters the foam interior. The presence of low porosity skin restricts air movement contributing to pneumaticity and deadness. The effect of porous skin on recovery rates from deformation, as determined by bounce tests, is shown in Table 2. The most lively foams were the porous surface core molded foams followed by porous surface solid molded foam.

The test method used consisted in dropping a ball from a fixed height and noting the height of the original bounce and the total number of bounces to total dampening. Although the test used was empirical, it was effective in picking up relative differences in the foam specimens tested.

TABLE 2. REBOUND RESILIENCE OF URETHANE FOAMS

Ball Drop Zone, 18 Inches; Ball Weight, 75 Grams

Sample	Initial Bounce: Inches	Initial Bounce: % of Total Height	Total Number Bounces
Slab urethane foam*	7 1/2	41.7	7
Molded Foam*			
Regular surface solid	5 1/2	30.5	6
Treated surface solid	9	50	10
Regular surface cored	7	39	8
Treated surface cored	10	55.6	11

*Foam density, 2.25 lbs./ft.³

Edge Hardness

Until recently, relatively little attention has been given to the proper design of urethane foam molds. For the most part, foam rubber mold designs have been employed. As a result, many of the objects made in the early stages of urethane foam molding development, particularly those made for cushioning use, had an objectionable hard rind. This was usually present at the edge of the molded piece in the area corresponding to the parting line of the mold. Foam hardness in this region was found to be due to escape of gas from the foaming mass at the mold closure line, which was brought about by shearing of the cells due to excessive foam movement. Of course, this condition may also be aggravated by any excessive overloading of the mold.

Experience has shown that proper design of the mold will effectively eliminate edge hardness. The mold used must provide a tight seal at the mold parting line. Provision must also be made for the escape of displaced air and excess material in a region well removed from the edge of the molded half cushion. The use of molds, such as shown in Figure 6A and B has proved effective. Although some residual hardness persists at the new gas exit points, it is unobjectionable when within the body of the finished cushion instead of at the edges.

TABLE 3. PHYSICAL PROPERTIES—SLAB *VERSUS* MOLDED URETHANE FOAM

	A*		B†	
Property	Slab	Molded	Slab	Molded
Density, lbs./ft.^{3}	2.3	2.2	2.5	2.4
Tensile, psi.	19	21	18	18
Elongation, %	325	300	300	310
Compression/deflection, psi.				
25%	0.38	0.40	0.42	0.38
50%	0.54	0.53	0.60	0.54
Compression set, %				
50% deflection	6	5	5	5
90% deflection	5	5	6	5
Resilience, %	48	54	48	54

*A=Polyoxypropylene glycol foam.
†B=75 parts polyoxypropylene glycol, 25 parts tetronic foam.

Compressive Pressure and Molded Foam Stability and Density

The gross effect of pressure within the mold leading to foam densification and/or foam collapse is well known in urethane foam molding. Industrial experience has shown that some compressive pressure, during foam expansion, is necessary to aid in final foam distribution. What has not been known is that during molding, excessive compressive pressure *must* be released during foam gelation. Unless this is done, foam collapse may result.

A series of experiments was conducted to determine the quantitative effects of compressive pressure on expanding foam. By using a mold having a tight, but free-floating cover plate, compressive pressure on the rising foam was varied by the addition of weight on the mold cover plate. The cover plate was loaded incrementally until foam collapse occurred. The results of these experiments are shown in Figure 7 in which foam density is plotted against compressive pressure up to the collapse point. These data show that there is a linear relation between foam density and applied compressive pressure, with density increasing with increasing compressive pressure up to the collapse point. Thereafter, density pressure relations in the collapse region are meaningless because of destruction of the foam structure.

It is obvious that, from a density viewpoint, the ideal compressive pressure used should be essentially zero. Zero compressive pressure (no cover plate) should be avoided, however, since higher foam densities will result, caused by loss of heat generated during the reaction and collapse of foam at the surface forming a heavy skin. Additionally, a covering plate prevents the "bun effect," a characteristic of presently produced slab foam. The application of compressive pressure techniques to slab foam production should minimize foam scrap losses resulting from trimming and squaring of the slab loaf.

The effect of foam thickness *versus* exerted compressive pressure on the collapse point of urethane foam has been determined and is presented in Figure 8. For the systems investigated this curve shows that the maximum compressive pressure which may be exerted on the foam before collapse results, is directly dependent on the foam thickness. For this reason the compressive pressure being exerted on a foaming mass becomes more critical, the thinner the section being molded. Obviously, the production of molded urethane foam items at thickness above one or two inches should introduce the least difficulties.

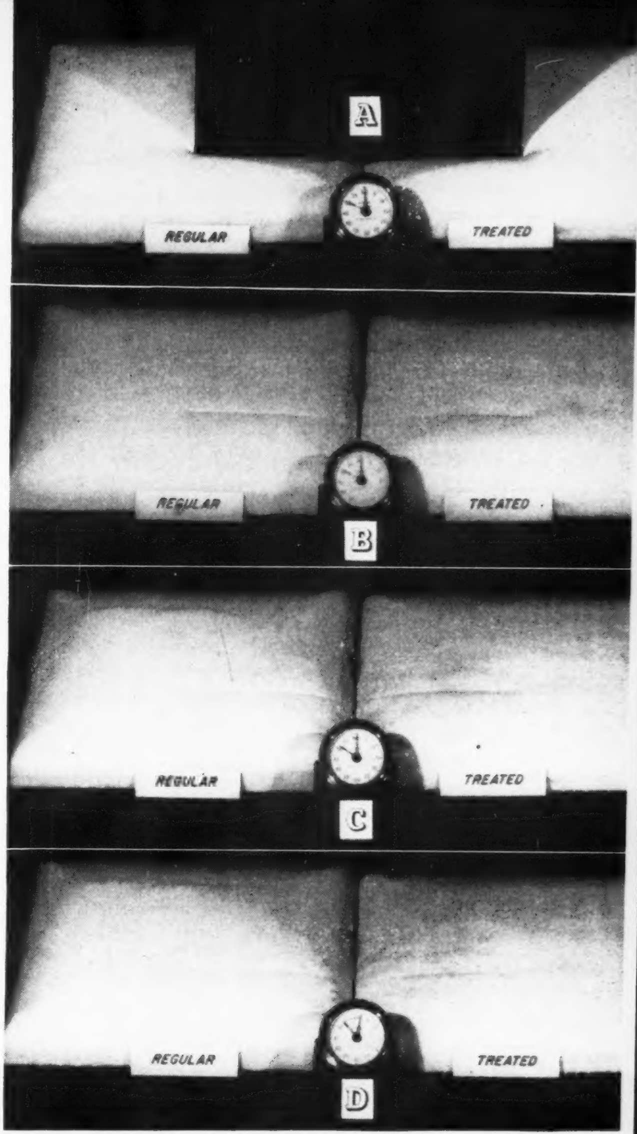


Fig. 5. View of test apparatus for deliberate surface marking of regular and treated surface molded resilient urethane foam (A). Loading 3 psi. applied for 50 minutes. B is view of surfaces immediately after removal of load; note that the mark on the treated surface foam is less pronounced than on the regular foam surface. C is view of foam surfaces one minute after removal of load. D is view of foam surfaces three minutes after removal of load, and the treated surface foam shows essentially complete recovery. The surface mark on the regular foam persisted for one hour after load removal.

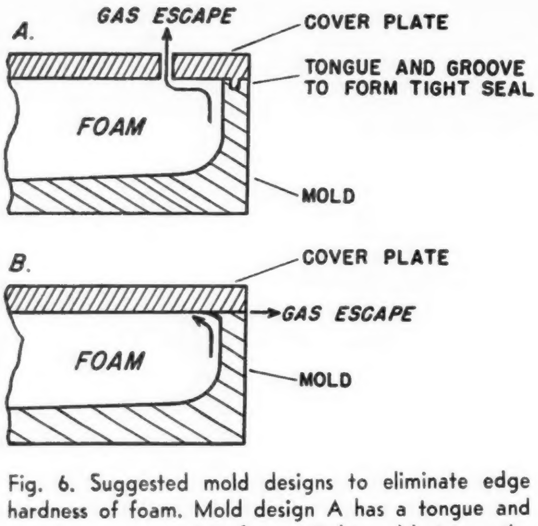


Fig. 6. Suggested mold designs to eliminate edge hardness of foam. Mold design A has a tongue and groove arrangement to form a tight seal between the mold and the cover plate and a gas and foam escape vent well removed from the edge of the molded half cushion. Mold design B has an inward inverted lip which forces the gas and foam to be directed inward initially, after which they escape along the cover plate underside.

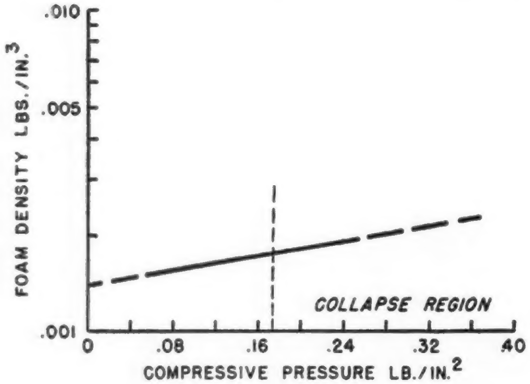


Fig. 7. Effect of compressive pressure during foam expansion in molding and foam density.

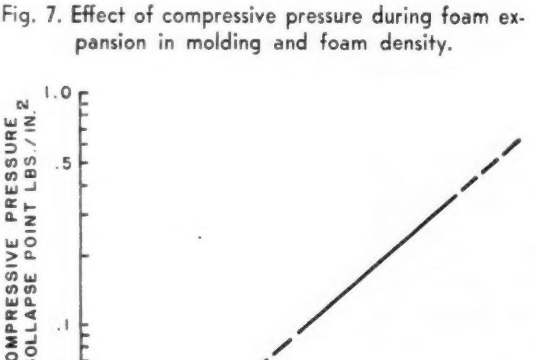


Fig. 8. Critical compressive pressure *versus* foam thickness and collapse point.

Molded *versus* Slab Urethane Foam Physical Properties

Laboratory work has shown that the physical properties of uncored molded resilient urethane foam are comparable to slab foam provided the comparison is made at the same foam density. Table 3 summarizes the physical property data taken on a number of typical polyether systems. The data in Table 3 show that molded foam is equivalent to slab foam. Both the slab and the molded solid foams were made under the same processing condition using a typical foam formulation given in Table 4.

Flex Resistance of Resilient Urethane Foams

The resistance to flex of cushioning materials affords a qualitative method of determining their durability. Urethane foams, like other foam materials, suffer a decrease in load bearing capacity immediately after being subjected to multiple flexing. The load bearing capacity is regained, however, when the foams are held under no load and at room temperature. The

TABLE 4. TYPICAL RESILIENT FOAM FORMULATION

Ingredients	Parts	
Prepolymer*	100.0	To give 9.5% free NCO
Hylene† TM		
Didecyl phthalate	5.0	
Silicone oil‡	0.5	
N-Methylmorpholine	1.0	
Triethylamine	0.3	
Water (105% theory)	2.5	

*Polymers prepared from polyalkalene ether glycols and Hylene TM in the ratio of 75 parts of glycol to 25 parts Hylene TM.

†Du Pont registered trade mark for toluene diisocyanate.

‡Available as DC-200, Dow Corning Corp.; Silicone L-45, Silicones Division, Union Carbide Corp.; SF-95 series, General Electric Co., 5-50 centistokes range.

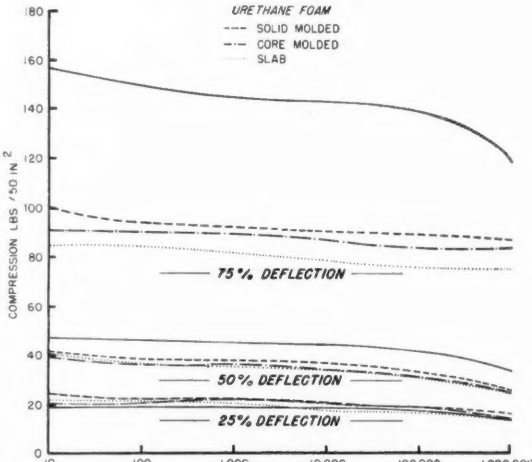


Fig. 9. Effect of multiple flexing on the load bearing capacity of molded and slab foam materials.

effects of multiple flexing on load bearing properties of urethane foam and foam rubber are shown in Figures 9 and 10. Samples of foam rubber were selected as a multiple flexing control because of its long known use as a seating material.

An inspection of the above figures shows that both cored and solid molded foam are equivalent to slab foam in the rate and the degree of load bearing capacity fall off and recovery. The foam rubber control also shows similar compression/deflection decay and recovery when subjected to repeated flexing. The higher compression deflection values of foam rubber, particularly at 75% deflection (top solid line, Figure 9), may be attributed to a mass effect since the density of the foam rubber used was 6 lbs./ft.^{3}; whereas the densities of the urethane foam specimens used were 2 to 2.5 lbs./ft.^{3}. Aside from the drop-off in compression/deflection, the urethane foams tested showed no visible signs of physical deterioration.

The equipment used for multiple flexing is shown in Figure 11. The test specimens used were 20 by 20 by 5½ inches and were subjected to 75% deflection 60 times per minute. The samples were removed from the flexer at various cumulative flex intervals to determine the change in compression/deflection characteristics.

In addition to dynamic deflections, the effect of

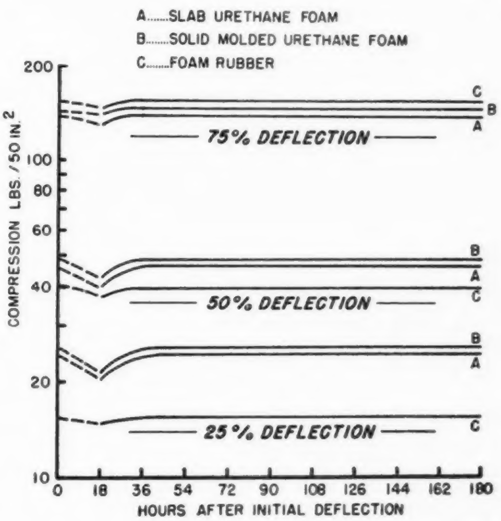


Fig. 12. Effect of static deflection on foam materials.

TABLE 5. SOLID *VERSUS* CORE MOLDED RESILIENT URETHANE FOAM

Property	Molded Foam Type: Solid	Molded Foam Type: Cored (Core Volume, 12%)
Volume ft.^{3}	0.612	0.545
Foam weight, lbs.	1.509	1.372
Weight saving, %	—	9+
Foam density, lbs./ft.^{3}		
Apparent	—	2.24
Actual	2.47	2.52
Compression lbs./50 in.^{2}		
25% deflection	12.9	12.4
50% deflection	23.2	23.1
75% deflection	60.3	62.1

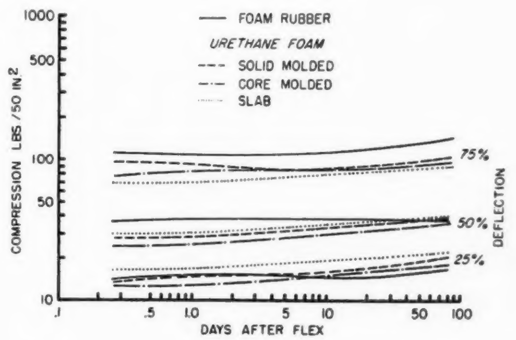


Fig. 10. Recovery of molded and slab foam materials from multiple flexing.

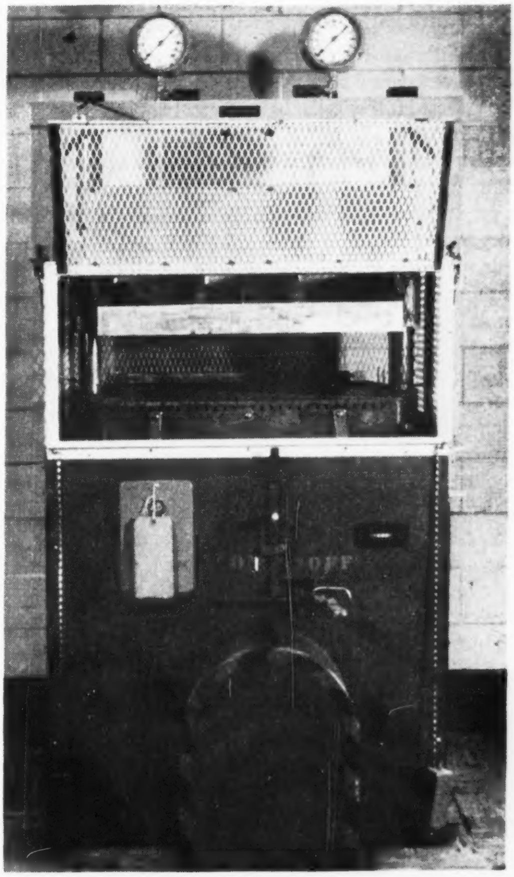


Fig. 11. View of apparatus used for flex testing of foam materials (75% deflection/60 cycles min.).

static compression on foam materials has been determined. The same softening or relaxation was found to occur under static conditions, with the load bearing properties being regained when the test specimens were held at no deflection and room temperature. Typical relaxation and recovery curves for foams statically deflected are shown in Figure 12.

Foam Density Reduction

Core molding has been investigated by the elastomers laboratory as a means of reducing the effective density of finished urethane articles. The benefit to be derived from coring is weight reduction per molded unit while maintaining equivalent physical properties. As shown in Table 5, at a typical core volume of 12%, a weight savings of 9% results, while the physical properties, as measured by compression/deflection, are equivalent. No paradox exists since although the apparent density is lower, the actual foam density of both cored and slab molded foam is equivalent. The concentration of foam in columns, the greatly increased surface area of the foam cores plus the long axis of the foam cells oriented vertically, results in equivalent compression/deflection at lower overall density.

With regard to concentration of foam in columns, an inspection of the cellular nature of core *versus* solid molded foam shows that there are flow lines in the core molded foam which follow the general contour of the core elements. The foam cells, along these flow lines, are "egg shaped" or elongated, with the long axis of the cells being oriented vertically along the flow lines. It is well known that when a force is applied to the end of an egg, it will resist deformation more than when applied to the short axis. Extensive physical test data gathered by the elastomers laboratory have shown that the physical properties, determined in the direction of foam rise (long axis) of a resilient urethane foam, are superior to those determined perpendicular to the direction of flow (short axis).

The greatly increased surface area of the foam cores will contribute to improved compression/deflection values since the actual density of the foam surface formed during molding will be higher in density than the main foam body. Since compression at constant deflection is a direct function of density, it is logical to assume that an increase in compression values will, therefore, result from the increased surface area.

Also, the concentration of foam in columns, as an inclusive term, has been abbreviated. More correctly, the concentration of foam in columns interconnected by supporting arches (the result of coring) will result in an increase in compression at constant deflection and constant foam density. This result is probably due to the fact that the column and arch arrangement referred to has long been recognized in architectural engineering as representing one of the sturdiest of load bearing arrangements.

An additional benefit derived from core molding is the improvement in rate of recovery from deformation. Using a Yerzley oscillograph,[13] a curve denoting the height recovered with time was plotted. On the average, Yerzley oscillograph slope values of 2.5 were observed for core molded foam, compared to 1.75 for solid molded foam. This represents an appreciable increase in recovery rate leading to a more lively foam, as evidenced by bounce tests previously given in Table 2.

The primary objective of this work has been to show that core molding is a practical method of reducing molded item weight and, consequently, cost. Although the data presented have been based on a core volume of 12%, this is not to imply that this is the maximum core volume which may be used. While successful core molding of urethane foam has been obtained at 22% core volume, there is no obvious reason why considerably higher volumes cannot be employed.

The controls and precision required for core molding are more stringent than for solid molding. Particular attention must be given to the design of the cores, to the distribution and loading of foam in the mold, and the placement of the cores in the mold. Experience has demonstrated that excellent reproducibility in core molding may be achieved.

Resilient Urethane Foam Molding's Future

Molding technology and equipment have been developed. Previous work has shown this method of processing to be a highly reproducible and practicable operation. Limited quantities of molded resilient urethane foam articles are now commercially available from several companies. Although a complete switch from slab foam to molded foam is not anticipated, this operation is expected to occupy an important future position in the cushioning industry. Molding should allow potentially lower unit manufacturing cost made possible through high-volume production for either single units or a multiplicity of shapes and sizes. In addition, material costs should be reduced by eliminating scrap losses. Finally, molding should allow the preparation of articles of intricate shapes and/or combination of dissimilar materials with a minimum of operating labor, a factor which is becoming of ever-increasing importance.

Summary and Conclusions

In summary, methods have been described for eliminating defects in molded resilient urethane foam which heretofore have been considered to be inherent in this unit operation. Sufficient data have been presented to show that the physical properties of molded foam are equivalent to those of slab foam. Finally, the benefits to be derived from urethane foam core molding have been described.

The methods that have been developed have been shown to be effective in eliminating such defects as skin coarseness, cellular irregularity, non-uniformity of density, hard edges, surface marking, pneumaticity, and slow recovery from deformation.

[13] *Rubber Chem. Tech.*, Jan., 1940, p. 149.

The ASTM[1] Crude Natural Rubber Subcommittee—Organization, History, and Accomplishments

By NORMAN BEKKEDAHL,[2] and ROBERT G. SEAMAN[3]

National Bureau of Standards, Washington, D. C. RUBBER WORLD, *New York, N. Y.*

IN THE relatively short period of time that commercial synthetic rubbers have been in existence their uniformity of technical properties has become far superior to that of natural rubber. The reason for this is undoubtedly that when some of these synthetic rubbers were produced under control of the U. S. Government, a committee was authorized to develop methods for testing them and setting up and enforcing specifications that would be mutually acceptable to both the consumer and the producer (1).[4] From the successful operation of this committee and the synthetic rubber plants (2) it was seen that a similar type of control should also be able to improve the uniformity of the natural rubber.

Therefore at a meeting of the American Society for Testing Materials in June, 1949, Committee D-11 (Rubber and Rubber-Like Materials) established a new working group, which was given the title Subcommittee 12 on Crude Natural Rubber, and was given the task of trying to improve upon the present system of evaluating the natural rubber. In the present paper the authors, who are chairman and secretary, respectively, of this committee, attempt to describe events leading up to the formation of the committee, to present a brief history of the committee, and then to describe its accomplishments to date.

Visual Inspection Standards

Ever since the beginning of the rubber industry the natural-rubber broker has purchased his rubber from the producer and sold it to the manufacturer on the basis of a few rule-of-thumb tests or visual observations. At the present time practically all of the natural rubber is graded (3) according to International Natural Rubber Type Descriptions adopted by the Rubber Manufacturers Association, Inc. or to Singapore Natural Rubber Type Descriptions adopted by the Singapore Chamber of Commerce Rubber Association. All of these type descriptions have been endorsed by the Rubber Trade Association of New York and also by a number of other leading natural-rubber trade associations throughout the world. In order to facilitate the grading of the rubber, direct comparisons of it can be made with official type samples prepared in book form by the RMA and the RTANY.

Practically all of the production of rubber from the *Hevea brasiliensis* tree can be classified into one of these types. This system of classification has the decided advantage in that the grading can be done in a very short period of time and that the only tests that require the use of a laboratory are those for the quantitative determination of copper and of manganese content.

If a search is made through the great number of papers in scientific journals dealing with crude natural rubber, the conclusion is reached that the rubber technologist concerned with manufacturing operations would much prefer to purchase his rubber in accordance with specifications based on scientific laboratory tests rather than from results obtained by visual inspection, which describe only the superficial appearance. He purchases most of his compounding ingredients on the basis of specifications that are dependent on scientific laboratory tests, and the final rubber products that he makes are usually sold on a performance or quality basis rather than on appearance alone. So why should not his crude natural rubber be purchased on the basis of technical specifications?

The evaluation of natural rubber according to type descriptions solely on the basis of superficial appearance is, however, not altogether unwarranted or unsound. The system operates on the assumption that when a crude natural rubber is very clean, has good uniformity of color, and is free from gas bubbles, "rust," or fungus formations, it probably has undergone excellent care in preparation and will therefore exhibit uniform and consistent physical and chemical properties. This assumption, however, does not always hold true. The cleanliness of raw rubber, which is a very important factor, is extremely variable in all the present grades of natural rubber (4), and there seems to be very little or no correlation between the harmful-dirt content and the RMA grades of sheet and crepe rubbers (5).

This is extremely unfortunate since the manufacture of certain types of commercial products such as surgical goods requires that extremely clean rubber be used, and no rubber product manufacturer is ever sure of obtaining a clean raw rubber by purchasing even the highest grades. There is also a great variation within similar grades of rubber as to the physical and chemical

[1]American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.
[2]Chairman, Subcommittee 12, ASTM Committee D-11.
[3]Secretary, Subcommittee 12, ASTM Committee D-11.
[4]Numbers in parentheses refer to Bibliography items at end of this article.

The Authors

Norman Bekkedahl, chief, polymer structure section, National Bureau of Standards, received his B.S. degree in 1925 from the University of Minnesota, his M.S. from George Washington University in 1929, and his Ph.D. from American University in 1931.

Dr. Bekkedahl joined the National Bureau of Standards as a research chemist in 1931 in its Rubber Section, where he remained until he was made chief of the polymer structure section in 1954.

He is a member of the American Chemical Society and its Division of Rubber Chemistry, and is chairman of the Division's New Publications Committee and of the Editorial Board of its publication, "Rubber Reviews." He is also a member of the American Society for Testing Materials and its Committee D-11 on Rubber and Rubber-Like Materials and is chairman of the D-11 subcommittee on crude natural rubber. Among his other memberships are Alpha Chi Sigma, Sigma Xi, and the American Association for the advancement of Science. He is also a member of the Washington Academy of Sciences, the Cosmos Club, and is a past chairman of the Chemical Society of the Washington Rubber Group.

Dr. Bekkedahl has been very active in the field of natural and synthetic rubbers and other high polymers throughout his entire career.

Robert G. Seaman, editor and general manager of RUBBER WORLD, received his B.Chem. degree from Cornell University in 1925. He was employed by United States Rubber Co. for 13 years prior to joining RUBBER WORLD as technical editor in 1942. He became editor in 1945 and editor and general manager of the magazine in 1959.

As a member of the American Chemical Society and its Division of Rubber Chemistry, Mr. Seaman is chairman of the Division's committee on nomenclature and is a member of its new publications and education committees. As a member of the American Society for Testing Materials, he is chairman of subcommittee 8 on nomenclature, secretary of subcommittee 12 on crude natural rubber, and a member of subcommittee 13 on synthetic elastomers, subcommittee 16 on classification and description of rubber compounds, and subcommittee 27 on resilience. As a member of the American Society of Mechanical Engineers, he is a past chairman of its Rubber & Plastics Division. Mr. Seaman is also a member of the 1959 International Rubber Conference Committee and secretary of the program committee for this meeting.

Conway Studios
Robert G. Seaman

Norman Bekkedahl

properties of the raw material, such as viscosity, hardness, and rate of cure (6, 7). It has also been reported that the presence of bubbles inside the sheet usually has no detrimental effects on the quality of the products made from it (7-9).

Earlier ACS Crude-Rubber Committee

Previous to the formation of the present ASTM Committee 12 in 1949 there existed a similar type of committee in the American Chemical Society. In April, 1935, the Division of Rubber Chemistry of the American Chemical Society initiated its Crude-Rubber Committee, the functions of which were "to promote a better understanding between the producers and consumers of crude rubber and to act as a clearing house between the two groups for information on the quality requirements for various crude rubber, including latex" (10). Its chief duty was to develop and standardize methods for the testing of the raw rubber. Although it was in general agreement with the principle of adopting limits for the standardization of rubber (11), it did not have as part of its functions the setting up of specifications by which rubber could be purchased (12).

The excellent work of this committee was published in the form of progress reports (10-15) on such subjects as testing recipes, methods for determining copper and manganese, latex procedures, determination of dirt or foreign material, testing for plasticity and viscosity, determination of water absorption, sampling procedures, rate of cure, and the testing of wild rubbers.

ASTM Crude Natural Rubber Subcommittee Formed

The work of the ACS Crude-Rubber Committee was interrupted during the war, and it was decided by the Division of Rubber Chemistry that the committee would not be revived. After this decision was made, ASTM Committee D-11 (Rubber and Rubber-Like Materials) thought that a Subcommittee on Crude Natural Rubber would fit well into its structure. Therefore Subcom-

The ASTM Crude Natural Rubber Subcommittee — Its Organization, History, and Accomplishments

Ever since the beginning of the rubber industry, crude natural rubber has been purchased from producers and sold to rubber products manufacturers by rubber brokers and dealers on the basis of a few rule-of-thumb tests or visual observations. At the present time practically all crude natural rubber is graded according to "Type Descriptions and Packing Specifications for Natural Rubber Grades Used in International Trade," as adopted by the Rubber Manufacturers Association, Inc., and endorsed by the Rubber Trade Association of New York, Inc., and many other rubber trading and rubber products manufacturing organizations throughout the world.

Subcommittee 12 on Crude Natural Rubber of Committee D-11 on Rubber and Rubber-Like Materials of the American Society for Testing Materials was organized in June, 1949, to carry on the work of the former Crude Rubber Committee of the Division of Rubber Chemistry of the American Chemical Society in the field of quality requirements for crude natural rubber.

Details of the organization and accomplishments of this ASTM subcommittee, which have resulted in the development of ASTM D 1278-58T, Tentative Methods for Chemical Analysis of Natural Rubber, are described. The subcommittee is now studying the problem of setting up specifications for crude natural rubber based on laboratory testing in order to classify natural rubber on a technical basis. The problems of setting up specifications are difficult ones, and Subcommittee 12 needs the full support, cooperation, and assistance of both the rubber producing and rubber consuming industries.

It cannot be stressed too strongly, however, that ASTM merely establishes specifications and standards. Their use and enforcement are left to voluntary actions of rubber producers and consumers.

mittee 12 was established with the scope, "The development of specifications and methods for testing and evaluating crude natural rubber." The chairman was given the authority in March, 1950, to proceed with the selection of committee members and to plan a program.

The newly formed ASTM Crude Natural Rubber Subcommittee held its first meeting on April 19, 1950, in Detroit, Mich. It also held two other meetings later that year and has usually held two meetings each year since that time. Abstracts of the minutes of all the meetings have been published in RUBBER WORLD and in *Rubber Age*, and the minutes of some of the early meetings were also published in considerable detail in these journals (16).

It would have been desirable for this subcommittee, as for all other ASTM committees, to obtain equal representation by active membership from both the consumers and the producers of the natural rubber. This, of course, proved impossible in the ASTM Crude Natural Rubber Subcommittee because most of the producer members are in the Far East.

The membership has consisted usually of about 20 representatives from rubber product manufacturing companies, about nine from the rubber producing companies, and about seven that belong to neither of these groups and are usually placed in a "general interest" class. The "general interest" members are composed of rubber chemists from chemical supply houses, government research institutions, etc.

The "producer" members have been very active and helpful through correspondence by mail, but unfortunately this type of communication is not so effective as actual presence at the committee meetings. The producers, however, usually have U. S. representatives attend the meetings in their behalf. The committee has been fortunate on several occasions to have had representatives from Europe at its meetings; but only twice, on October 14, 1950, and again on June 25, 1958, has it had *direct* representation from the plantations.

Dirt Content of Rubber

One of the first problems that Subcommittee 12 thought was important for study was the lack of cleanliness in the raw rubber. A laboratory test was therefore desired for the quantitative determination of harmful dirt. It was agreed by the members of the subcommittee that foreign solid particles, such as sand, dirt, bark, etc., that would not pass through a 44-micron (325-mesh) screen would be considered harmful in many products. A study of several test methods led to the improvement and adoption of two methods (17), which were presented at a Symposium on Recent Developments in the Evaluation of Natural Rubber (18) sponsored by Committee D-11 at the fiftieth annual meeting of the ASTM.

The first of these methods, Method A, known as the Hot-Oil Method, has the advantage of speed of operation, requiring only from two to four hours for completion. It uses a rather large specimen of rubber and thus permits a more representative sample. Method B, known as the Solvent Method, is simpler in operation than Method A, and although it requires a longer

elapsed time of operation, it does not require so much operator attention or skill.

Most laboratories preferred to use the Solvent Method, but both methods were accepted by the ASTM because the proponents of the Hot-Oil Method did not want their method to be forgotten, and they thought that it could be improved at a later date for simpler operation. Several laboratories in Europe did not wish to accept the Hot-Oil Method, largely because of the fire hazard involved; so the ASTM removed it from the official methods (19). There seems now to be general international agreement on the solvent method of test.

Copper, Manganese, and Iron

Committee D-11 had official procedures for the quantitative determination of copper and manganese in rubber products, but these methods were in need of revision, not only because they were cumbersome, but also because of some inaccuracies. Subcommittee 12 asked cooperation in this study from Subcommittee 11 on Chemical Analysis of Rubber Products.

As a result of this study, three methods were developed for copper and two for manganese (20). All of them use furnace heating for destroying the organic matter which was found to be much simpler than and just as precise as either the burner-ashing method or the wet-oxidation method. Both photometric and visual procedures are included.

One method for each of the metals is designated as the referee method by virtue of its precision or background of experience, but usually the alternative methods give equally satisfactory results. All methods determine the total amount of the metals in the rubber. It is recognized that some of the compounds of copper may not be harmful to rubber, but it is often not possible to determine which compounds are of this type. Compounds of this type, moreover, may themselves later become converted to harmful ones, and it therefore seemed preferable to include the total quantities of copper. Later, a method for the determination of iron was developed, and in 1958 the photometric methods for all three metals were included in the new "Tentative Methods for Chemical Analysis of Natural Rubber" (19).

New Chemical Methods Adopted

ASTM Committee D-11 had official methods for determining the amount of acetone extractable material, ash, volatile matter, and the natural rubber hydrocarbon content of rubber products (20). Subcommittee 12 decided that the methods for acetone extract and for rubber hydrocarbon content in rubber products were also applicable to unvulcanized rubber. It developed improved methods, however, for volatile matter and for ash determinations.

Then in June, 1958, upon recommendation of subcommittee 12 and Committee D-11, the ASTM approved the new "Tentative Methods for the Chemical Analysis of Natural Rubber" (19). These methods describe plans for the sampling of various-size lots of rubber, indicating the number of bales to be taken, and also the acceptance-rejection criteria. They also describe the method of sampling the individual bales, and the homogenizing of the piece taken from the bales.

From this homogenized piece are taken specimens for the determination of volatile matter, dirt, ash, copper, manganese, iron, acetone extract, and rubber hydrocarbon. This new ASTM designation is now almost complete in that it includes most all of the important tests desired for the evaluation of the chemical properties of crude natural rubber. It has been pointed out more recently, however, that a method is also needed for the quantitative determination of nitrogen, which would give an indication of the presence of excessive amounts of organic non-rubber material in natural rubber.

Subcommittee 12 is at present undertaking the development of a rapid method, probably involving infrared heating, for the determination of deterioration of rubber. It is hoped that a suitable method can be developed that can be executed in a few minutes on the bales of rubber at the docks or in warehouses and that will give an indication of the presence of excessive quantities of deteriorative accelerators such as copper and manganese.

Vulcanization Characteristics

Another of the important problems discussed in the early meetings was the type of formula or compounding recipe to use when physical tests are to be made on the rubber vulcanizates. The ACS Crude-Rubber Committee (11) had adopted a formula, later known as the ACS-I recipe, which proved to be excellent in bringing out the important vulcanization characteristics in a raw rubber.

It has, however, the disadvantage of being very sensitive to moisture content of the rubber and to atmospheric humidity conditions during storage of the compounded rubber before vulcanization. It was later found that this sensitivity could be decreased greatly by changing slightly the accelerator of the mix (21), but by that time the ACS-I recipe had become so well established throughout the world that Subcommittee 12 decided that no change should be made in it. The errors that are caused by variation in moisture content during storage can be practically eliminated by storing the compounded mix in a tightly closed container between the compounding and the vulcanization operations. This ACS-I recipe has since been adopted by ASTM Committee D-11 and is now known as its Standard Formula 1A for natural rubber compounds (22).

The ACS Crude-Rubber Committee also developed another formula, the ACS-II recipe (15), which it found superior for evaluating wild rubbers. In this recipe the quantity of stearic acid is increased to take care of the deficiencies of fatty acids in many of these wild rubbers.

The National Bureau of Standards (23) found this recipe very satisfactory in evaluating thousands of wild-rubber samples during the war when there was a shortage of plantation rubber. Vulcanization tests requiring the use of this recipe, and also other tests such as "shrinkage" caused by elimination of large amounts of dirt and moisture (23), which are important for evaluating these wild rubbers, have not been found to

be of any interest to Subcommittee 12 because they have no advantage in the testing of plantation *Hevea brasiliensis* rubbers.

Technical Classification

In 1949 the French rubber producers developed a scheme for classifying natural rubber into nine technical grades (24) based on laboratory tests intended to show ease of processing and rate of cure. This classification did not attempt to stand alone, but was superimposed on the better grades of the International or RMA type descriptions. Other Far Eastern producers soon began to follow the same plan. Limits were set on viscosity measurements made by the Mooney viscometer to describe the processibility, and also on single-modulus values of an ACS-I recipe vulcanizate to characterize the rate of cure (25).

It was soon discovered that the Mooney viscosity values increased constantly during storage, and the classification according to this property was therefore meaningless. In January, 1953, the technical classification was reduced to three classes (26) based on a single-cure stress-strain test.

Even in single-cure tests there was disagreement as to what is the actual rate of cure. It was thought that no one single cure would tell the whole story, and that at least three cures were necessary (27). It has since been shown that the Mooney viscometer is a reliable and practical instrument for measuring scorch and cure characteristics of rubber compounds (28), which could be used to replace two of the three cures.

The single-cure stress-strain test, however, gives a good deal of information, and technically classified rubbers are still graded as high-, medium-, and low-modulus rubbers. This technical grading of natural rubber is an excellent step forward. It should lead to the production of a more uniform grade of rubber because the producer, by making variations in his processing, can now shift his technical properties to suit the market demands of the consumer.

A number of test methods have been developed by other subcommittees of ASTM Committee D-11 that are also applicable for the evaluation of the raw product. They are methods of sample preparation for physical testing of rubber products (21), tension testing of vulcanized rubber (29), strain testing of vulcanized rubber (30), viscosity of rubber and rubber-like materials by the shearing disk viscometer (31), and curing characteristics of vulcanizable rubber mixtures during heating by a shearing disk viscometer (32). Where new tests are needed, Subcommittee 12 works in close cooperation with the appropriate ASTM committees.

Standard Natural Rubber Samples

During the period of synthetic rubber production by the U. S. Government the industry found it necessary to have available standard samples of the various types of rubber if the synthetic rubber plants were to produce a uniform product that would meet desired specifications. This necessity for standard synthetic rubber samples still persists even though the synthetic rubber manufacture is now on an industrial competitive basis. This favorable experience with the standard synthetic rubber led the industry to request a standard natural rubber also.

Although it has not been the function of Subcommittee 12 to develop or produce this standard, it has watched with great interest the progress in the development of a successful solution of the problem. The first attempt to prepare a large batch of uniform rubber was made with spray-dried latex (33).

Unfortunately, this type of rubber did not have physical properties that were near those of the average smoked sheet or pale crepe rubber on the market. It was later found that blending smoked sheet in a Banbury mixer could prepare a uniform batch of natural rubber (34). However, the further blending of these batches that would be required to produce a lot large enough for a standard sample was not practical.

A standard natural rubber was finally prepared by blending a large lot of natural rubber latex. Then, by taking extreme care in processing, it was possible to produce a large lot of the dry rubber with exceptionally uniform properties. This rubber is now sold by the National Bureau of Standards in packages of 31,500 grams each, with certifications of properties for ASTM Formulation No. 1A as to minimum viscosity, incipient cure, and cure index by the Mooney shearing disk viscometer at 125° C.; the strain at 5 kg/cm^2, the stress at 100% elongation, the stress at 600% elongation, the stress at failure, and the elongation at failure for 10-, 20-, and 40-minute cures at 140° C.

Natural Rubber Specifications

Up until the present time the primary aims of Subcommittee 12 have been the development of physical and chemical testing methods that can be used to evaluate natural rubber. The subcommittee has now progressed to the point where its work on the development of test methods is almost complete. It has therefore been decided to study the problem of setting up specifications based on laboratory testing in order to be able to classify natural rubbers on a technical basis.

The announcement of the change of work direction led to protests from the rubber producers, both in the form of written communications and also from producer representatives at the committee meetings. They oppose the introduction of specifications superimposed upon the existing international grading system. H. C. Bugbee, President of the Natural Rubber Bureau in Washington, D. C., and also an active member of Subcommittee 12, presented reasons on behalf of the Rubber Producers Council of Malaya for protesting this specification work in ASTM. He stated that technical specifications would impose conditions too impracticable to meet. The testing of the rubber would be a bottleneck which would slow down plantation production and make the rubber more expensive.

However, it was the almost unanimous opinion of the members that Subcommittee 12 should proceed with the development of specifications. This was done largely with the feeling that the producers were not aware of the true circumstances. *It must be stresssed*

that ASTM merely establishes specifications and standards. Their use and enforcement are left to the voluntary actions of the producers and the consumers. A consumer of natural rubber certainly would not attempt to purchase his rubber under specifications that the producer could not meet.

In addition to the visual specifications of the international type descriptions, there already exist specifications as to the maximum amount of copper and manganese that may be allowed in the rubber (31); and these determinations require laboratory testing. At a recent meeting of Subcommittee 12 it was pointed out that there is also a need of a specification as to the maximum amount of ash that a rubber should contain. It was reported that recently the ash content of some smoked blankets and Ambers frequently was more than 1% and sometimes almost 2%; whereas in the past it had always been only a few tenths of 1%. No visual inspection can determine the amount of ash present; nor can it identify the presence of excessive quantities of organic non-rubber material. In cases such as these, where abnormal rubbers are placed by visual inspection in the same classification as high-quality rubbers, laboratory testing is required to distinguish them.

ASTM Committee D-11 has developed test methods and introduced specifications for concentrated, ammonia-preserved, creamed, and centrifuged natural-rubber latex (35), and both the producers and consumers of latex work in harmony and have agreed on purchase specifications. In Committee D-11 there was also introduced a new subcommittee on synthetic elastomers when the styrene-butadiene synthetic rubber manufacture was transferred from the hands of the U. S. Government to private industry. All this synthetic rubber has continued to be manufactured and sold according to producers' technical specifications based on physical and chemical laboratory tests. Undoubtedly the day will come when the synthetic polymers will become so improved and so versatile that the natural rubber producers will be forced to grade their rubber in a manner similar to that used in the synthetic rubber industry. It is generally believed by the rubber technologists of this country that the study of specifications by the ASTM Subcommittee 12 of Committee D-11 would be as beneficial to the future of the producers as it would be to the consumer.

The problems of setting up specifications are difficult ones, and Subcommittee 12 needs the full support, cooperation, and assistance of both the rubber producing and the rubber-consuming industries.

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(14) *Ibid.*, 14, 755 (1941).

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(19) ASTM Designation D 1278-58T, "ASTM Standards," Part 9, p. 1761 (1958).

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(21) W. P. Fletcher, *J. Rubber Research Inst. Malaya*, 12, 258 (1950).

(22) ASTM Designation D 15-58T, "ASTM Standards," Part 9, p. 1225 (1958).

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(31) ASTM Designation D 927-57T, "ASTM Standards," Part 9, p. 1158 (1958).

(32) ASTM Designation D 1077-55T, "ASTM Standards," Part 9, p. 1163 (1958).

(33) E. M. McColm, ASTM Special Technical Publication No. 136, p. 79 (1952).

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Educational Mission to Russia

An eight-man mission to the USSR of American engineering educators, who spent three weeks studying and inspecting the Russian system, reports that engineering education is an integral part of the planned economy of the USSR. The committee observed that Russian engineering education is of dynamic character and is constantly in the process of evaluation.

The mission was composed of eight engineering professors from various American universities with Dr. Frederick C. Lindvall, chairman of the Division of Engineering at California Institute of Technology, serving as chairman, and Prof. Newman A. Hall, head of the Department of Mechanical Engineering at Yale University, as secretary.

This mission was initiated by our State Department under an agreement with the USSR for the exchange of scientific and cultural delegations. A similar Soviet mission is expected to return the visit during February.

Properties of Elastomers Up to 550° F.—II*

By F. M. SMITH

Firestone Tire & Rubber, Akron, O.

THE following installment concludes the informative and interesting article on the properties of elastomers up to temperatures of 550° F. which was begun in our January issue.

Resilience Properties of Elastomer Compounds

A simple steel ball rebound test, which was readily adaptable to high-temperature testing, was used to determine the comparative resiliences of the various elastomers in the —40° F. to +500° F. temperature range. In this test, resilience is obtained as the ratio of immediately recoverable energy to the energy required to produce deformation in the test sample. Typical rebound curves for elastomer types are shown in Figures 19-23.

All elastomeric compounds had increased rebound resilience at elevated temperatures and usually reached a semi-plateau before the polymer started to degrade, as shown by decreasing values for *Hevea* above 350° F. (Figure 21), or began to cross-link rapidly as shown in the upsweep of the neoprene or resin-cured butyl rubber curves of Figure 19.

At temperatures below that of the minimum rebound values, a polymer vulcanizate begins to lose its rubbery properties; therefore the lower the temperature at which this condition occurs, the better the compound is for cold-temperature behavior.

The plots of % rebound *vs.* temperature were grouped in Figures 19-23 to avoid overlapping as much as possible. Thus in Figure 19 the minimum rebound of Thiokol was shown to occur near —10° F., that of neoprene near 16° F., and that of the phenol dialcohol-cured butyl rubber near 73° F. Note that degradation of Thiokol began near 300° F. Neoprene maintained high rebound, some of which was due to embrittlement, above 400° F. The acrylate polymer shows the lowest rebound and the poorest cold-temperature resilience since its minimum rebound occurs at 73° F. (Figure 20).

Hevea was expected to have good low-temperature properties, and the minimum rebound point at —40° F. supported this expectation. Polyurethanes L-1 and L-2 had minimum rebound points occurring at the same temperature (0° F.), but the minimum value of the conventional L-1 was 27% lower than that of the heat-stable polymer L-2. In this instance the higher rebound of the L-2 polymer did not represent greater rubbery resilience, but rather a higher modulus since the polymer was in a semi-solid state at that temperature (Figure 21).

The two acrylates in Figure 22 have identical minimum rebound temperatures; however, the Fluoro-Rubber 1F4 became more resilient at high temperatures than did Hycar 4021. Hypalon was better for low-temperature properties with a minimum rebound at 32° F.

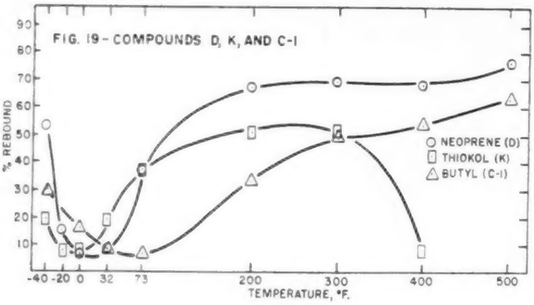
*Presented before the Division of Rubber Chemistry, ACS, Cincinnati, O., May 15, 1958. A major portion of the work reported in this paper was conducted under U. S. Air Force Contract Nos. AF33(616)-3108 and AF33(616)-3953, which was administered under the direction of the Materials Laboratory, Wright Air Development Center, Dayton, O.

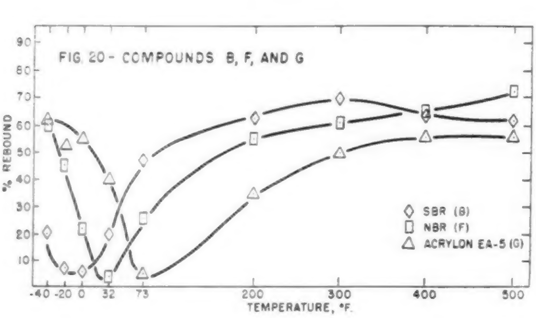
TABLE 6. AIR PERMEABILITIES OF ELASTOMER COMPOUNDS

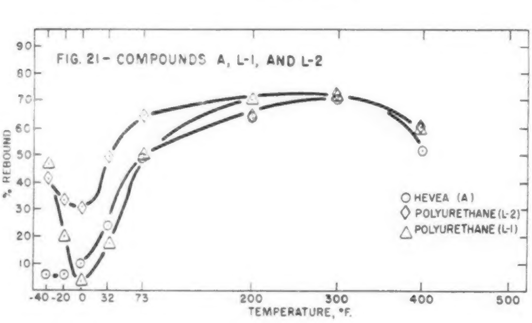
Permeability is expressed in cubic centimeters of air (corrected to STP conditions) per second which would permeate through one square centimeter of vulcanizate one centimeter thick (cc/sec/cm/cm^2) with one atmosphere of pressure difference.

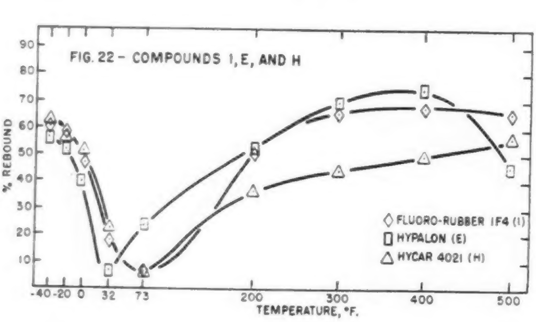
Compound No.	Elastomer	Permeability $\times 10^7$ @ 73° F.	176° F.	250° F.	350° F.
A	*Hevea* (50 phr. HAF black)	0.49	4.4	7.1	20.7
B	SBR (FR-S 1500) (50 phr. HAF black)	0.25	2.9	4.7	15.4
C-1	Butyl rubber (60 phr. HAF black)	0.02	0.46	1.8	6.1
C-2	Butyl rubber (50 phr. MPC black)	0.02	0.32	1.3	5.6
D	Neoprene Type GRT (50 phr. MPC black)	0.10	0.98	2.6	7.3
E	Hypalon S-2 (20 phr. HAF + 30 MgO)	0.72	0.73	2.3	6.2
F	NBR (Butaprene NL) (50 phr. HAF black)	0.13	0.8	2.2	6.6
G	Acrylon EA-5 (50 phr. HAF black)	0.16	1.5	3.7	10.2
H	Hycar 4021 (50 phr. HAF black)	0.19	1.8	4.8	9.4
I	Fluoro-Rubber 1F4 (35 phr. HAF black)	1.5	9.6	24	49
J	Vyram N-5400 (30 phr. Dixie 5 black)	0.007	0.24	0.56	5.1
K	Thiokol ST (50 phr. HAF black)	0.02	0.37	1.6	[b]
L-1	Polyurethane (30 phr. HAF black)	0.05	0.97	3.1	7.1
L-3	Adiprene C (25 phr. HAF black)	—	2.3	3.8	16.6
M-1	Silicone rubber (Silastic 916 U)	11.5	35	—	69
M-3	Silicone Rubber (Union Carbide X-1034R)	23	47	66	98
N-1	Viton A[a] (20 phr. Hi-Sil + 10 ZnO + 10 Dyphos)	—	0.88	3.6	14.6
O-1	Kel-F Elastomer (10 phr. ZnO + 10 Dyphos)	—	0.8	3.4	15.6

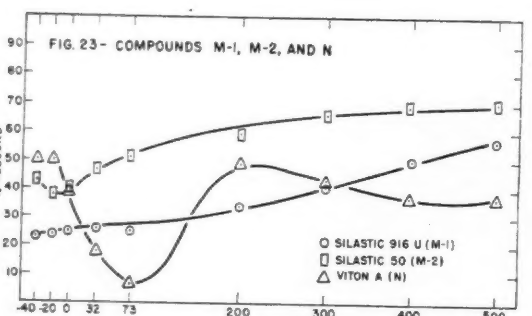
[a]Note difference in loading from other Viton A compound.
[b]Melted.











Steel ball rebound resilience of compounds between —40 and +500° F.: Fig. 19. D, K, and C-1; Fig. 20. B, F, and G; Fig. 21. A, L-1, and L-2; Fig. 22. I, E, and H; Fig. 23. M-1, M-2, and N

The minimum rebound value for Viton A occurred at room temperature, indicating poor low-temperature resilience (Figure 23). After a maximum value at 200° F., the % rebound decreased at increasing temperatures. Of the two silicone rubbers tested, the general-purpose Silastic 50 had higher resilience at all test temperatures.

Permeability and Temperature

Since elastomer compounds designed for use in heat-resistant tires and tubes will have to retain air or some other gas at elevated temperatures, the permeability to air of 18 compounds was tested at temperatures ranging from 73 to 350° F. The permeability of the compounds tested varied considerably with increase in temperature (Figure 24). At room temperature the permeability to air of some silicone rubber compounds was more than 1,000-fold that of the butyl rubber compounds (Table 6). At 350° F., however, silicone rubber was only 10-16 times as permeable as the butyl rubber compounds. The most permeable of the organic elastomer compounds was found to be Fluoro-Rubber 1F4, which behaved unlike either the other acrylates (Acrylon EA-5, Hycar 4021) or the other fluorine-containing elastomers (Viton A, Kel-F Elastomer).

A polyester polyurethane (L-1) had about half the air permeability of a polyether polyurethane (L-3) at 176 and 350° F.

Vyram N-5400 had the lowest permeability to air of all elastomers tested over the 75 to 350° F. temperature range. Several compounds, including Vyram N-5400, Acrylon EA-5, Hycar 4021, *Hevea,* SBR (LTP), NBR, and neoprene, became glazed on the surface and at times brittle, from oxidation, when tested at 350° F.

Testing Methods and Equipment

The tensile strength, ultimate elongation, and tear strength of the test compounds were measured at elevated temperatures on an L-6 Scott tester suitably enclosed in a temperature regulated, heavily insulated cabinet which permitted charging and discharging of test strips without undue cooling of the testing area. Full details of method and apparatus are given by Lavery *et al.* (12).† The L-6 Scott tester was chosen over the IP4 inclined plane Scott tester because the uniformly constant speed of separation of clamps conforms to specification ASTM D + 12 — 51T.[5]

The testing procedure followed for the short-term (eight-hour) aging was to age three tensile strips at each of the three temperatures, 250, 300, and 350° F. The tensile strips were tested at room temperature, and

†Numbers in parentheses refer to bibliography references which appear on p. 541 of our Jan., 1959, issue.

[5]American Society for Testing Materials, Philadelphia, Pa.

the median test value was recorded. Stocks which retained more than 75% of their original tensile strength after aging eight hours at 350° F. were aged at higher temperatures, using 50° F. temperature increments.

Using these data, the temperature at which the compound lost 25% of its original tensile strength was selected from a plot of tensile strength *vs.* aging temperature. A comparison of these temperatures was used to rate the polymers. The higher the comparison temperature, the more resistant the compound was to short-term heat exposure.

Stress-strain properties at elevated temperatures were measured on dumbbell strips which had reached equilibrium temperature. Initially a preheat period of 30 minutes was used. Later a six-minute preheat period was found to be sufficient after the test equipment was modified to give more rapid movement of air past larger wattage auxiliary heaters. Both preheat periods gave similar results. To insure getting the same preheat period, the tensile strips were loaded into the test equipment on a time schedule.

The tear resistance of compounds was measured in the high-temperature test equipment according to Method 4211 (crescent tear) of the Federal Test Method Standard 601;[6] the strips were preheated as in the tensile tests. Die "B" was used to cut the strips.

The Firestone steel ball rebound test was used to measure the resilience of vulcanizates. In this test a steel ball was dropped 100 cm. on to a cured rebound block (3/4-inch thick). The height of rebound was recorded as the percentage of the distance dropped (or energy input) (13). The apparatus is similar to that described in Method 11251 of Federal Test Method Standard 601 for measuring impact resistance of hard rubber except that neither the magnet height nor the sample position is variable. The test blocks were allowed one hour in an air oven, or 20 minutes in a dry ice and alcohol bath to reach equilibrium temperature.

For rebound tests on heat-aged vulcanizates, samples were kept in the oven for eight hours, then removed, and immediately tested. A period of about 15 seconds was required to remove a block from bath or oven and to measure the steel ball rebound three times. The temperature of a heated or cooled rebound block changed very little in this brief time interval.

Shore A hardness was measured at room temperature on the same blocks used in the rebound tests after preheat periods (one hour) and after aging (eight hours) at elevated temperatures. A minimum of 12 hours was allowed for the blocks to return to room temperature.

Permeability of elastomers was measured in a permeameter developed especially for high-temperature operation. The test specimen, which was 0.025-0.030-inch thick, was inserted between upper and lower halves of a permeameter cylinder having integral disk heaters in each half and a heavy jacket of thermal insulation (14). The sample was supported by a porous ceramic disk and the pressure was varied from 10 to 60 psi.,

[6] "Rubber: Sampling and Testing (April 12, 1955)." General Services Administration, Business Service Center, Region 3, Washington 25, D. C.

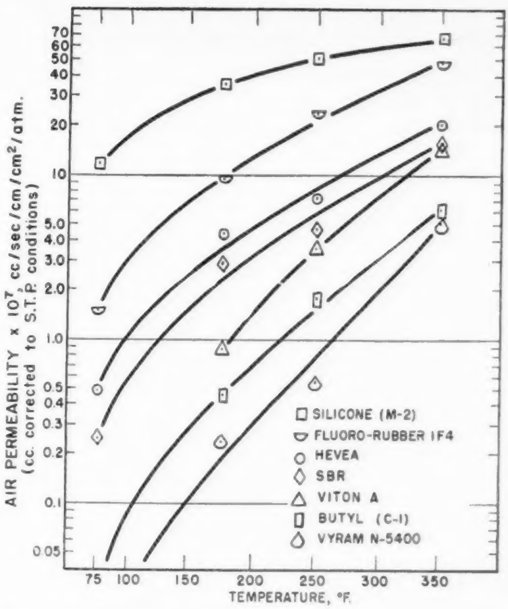


Fig. 24. Air permeability of elastomer compounds at elevated temperatures

depending on the test temperature, to get a convenient rate of permeation of air through the samples. Air permeating through the sample depressed the meniscus of an oil manometer outside the test chamber. Readings were taken every 15 minutes until rate of transmission became constant. The last four readings were averaged to obtain a cc/15-min. factor for use in the calculations. Permeability, Q, was expressed as cc/-sec./cm/cm²/atm., corrected to standard conditions of temperature and pressure.

Acknowledgment

The author wishes to express his appreciation to F. W. Stavely, Glen Alliger, and J. M. Willis for their interest and guidance, and to Sydney Smith for his invaluable help in collecting the test data. He also wishes to thank The Firestone Tire & Rubber Co. for permission to publish this work.

Tire Grit Blast Machine

The Goodyear Tire & Rubber Co. has installed a specially designed and patented grit blast machine to prepare aircraft tires for balance dough or patches. The grit blast machine not only thoroughly cleans the inside of the tire, but conditions the surface to produce a strong and consistent bond with the dough or patch.

Since the advent of tubeless tires the severity of this problem of keeping dough or patches consistently adhered to the tire during service has increased.

MEETINGS and REPORTS

QMC Conference on Military Uses of Fabrics for Coating Held at Natick

The theme of the conference emphasized the fabric portion of coated fabrics rather than the coatings and was well received by more than 250 delegates to the Conference on Military Applications of Fabrics for Coating sponsored by the Textile Fabrics Committee of the Advisory Board on Quartermaster Research & Development to the National Research Council of the National Academy of Sciences. The conference was held on October 16 and 17, 1958, at the Quartermaster Research & Engineering Center, Natick, Mass.

The meeting was opened with introductory remarks by W. George Parks, executive director, Advisory Board on Quartermaster Research & Development; Col. Hoke Wofford, Deputy Commander, Quartermaster Research & Engineering Command; and Stanley Backer, chairman, Subcommittee on Textile Fabrics.

Four Technical Sessions

Morning and afternoon sessions were held on each of the two days of the meeting. The first session was moderated by Dr. Backer and consisted of five papers. The first three were reports by the Army, Navy, and Air Force on military applications.

"Army Applications of Fabrics for Coating," by S. J. Kennedy, Quartermaster Research & Engineering Command, Natick.

This report breaks down the Army uses of coated fabrics into four categories: clothing; small, lightweight tents and covers; frame supported tents, paulins, and covers; and specialty uses such as air bags or water containers. Some indications of progress made to date and some hopes for the future were included in the report.

One illustration used was that of the Army raincoat. Before World War II this raincoat was made of double-texture fine-count cotton fabric bonded with a layer of rubber. By 1941 this had been reduced to a single-layer cotton print cloth or sheeting, but depth of coating, whether to coat one or both sides, and other questions had not been settled. The war forced an adoption of PVC coatings to conserve rubber.

Following the war the selection of a perfect material was again investigated since the PVC, and poly(vinylbutyral) also tried, had not proved completely satisfactory. This study, however, concerned itself primarily with coatings and did not give much emphasis on the fabric selection. Fabrics were chosen by availability rather than being engineered for the job. The current raincoat, part of the Army's plan to improve appearance, consists of 1.6-ounce nylon fabric, similar to Type II parachute fabric, coated on one side with poly(vinylbutyral).

One of the first attempts to find a new fabric for a particular use was a search for a fabric for the poncho made by QMC in 1946. This search failed to produce the desired cloth, but in 1956 a new poncho was tested using a two-ounce Fortisan[1] fabric with a neoprene coating that had the advantage of being resistant to thermal radiation and gas protective.

The development of protective suits for handlers of guided missiles has presented many problems. Protection is required against red fuming nitric acid, aniline, hydrazine, and other oxidizers. A Fiberglas[2] fabric coated with vinyl was used originally, but proved to be quite heavy. The current suit is made of a conventional cotton airplane cloth with a modified butyl coating, which is much lighter. A problem in any protective suit is the physiological one posed by the impermeable character of the material. No satisfactory solution to this problem has yet been discovered.

Similar problems have been encountered in the tenting and specialty fields. The use of coated fabric in all the four categories is increasing, however, and continued work is indicated to produce fabrics which are stronger, lighter, and resistant to conditions of the particular use.

"Naval Applications for Coated Fabrics," by Robert Grubb, Philadelphia Naval Shipyard, Philadelphia, Pa.

Most of the uses for coated fabrics in the Navy are in the inflatable equipment class at the present time, including such items as inflatable lifeboats and rafts and inflatable life-jackets. Two big areas of improvement are desired in these items. One is the reduction of weight. The other is elimination of mildew or fungi-caused deterioration. Some headway is reported in solving both problems, but considerable work is left to be done. Most of the current cloth furnished is of neoprene-coated nylon fabric.

Another great potential for coated fabric in the Navy is a replacement for the large amounts of treated canvas used for equipment covers, hatch covers, cargo well covers, other deck equipment, and deck awnings. Most of these articles are made from canvas impregnated with materials to make it fire, water, weather, and mildew resistant.

A study is being made at present to find a coated fabric which will eliminate the undesirable properties of treated canvas, but not introduce others. The canvas has served well for many years at low cost, and only superior materials at reasonable cost will be considered. At the time of this report several combinations of coated fabric looked promising, but nothing has yet been proved to be a good substitute for the treated canvas.

"The Role of Coated Fabrics in Today's Air Force," by Jack H. Ross, Wright Air Development Center, Dayton, O.

Coated fabrics are used by the Air Force in two general areas. First is the use for covers for either maintenance shelters or for protective covers in storage. The other use is in the interior of the aircraft for upholstery, curtains, floor coverings, seals, and many other uses.

Maintenance covers are mostly neoprene-coated nylon and are considered quite satisfactory as presently supplied. The protective covers, on the other hand, still leave much to be desired for completely satisfactory service. These covers are for wings and tail surfaces when the plane is standing outdoors and for covers on plastic windows to keep sunlight from creating high temperatures inside the aircraft. The wing and tail covers must be easily jettisoned for quick takeoff and must be able to stand for a brief period an accidental blast from a jet engine. This need will require more heat resistant fabrics as well as coatings. The covers for canopy uses must be light in weight, but must prevent passage of the light rays which, when focused by the canopy, can even start fires or melt elastomers within the aircraft.

The internal uses for coated fabrics also require that both the fabric and

[1] Celanese Corp. of America, New York, N. Y.

[2] Owens-Corning Fiberglas Corp., Toledo, O.

the coating be stronger and more heat resistant since indications are that temperatures of the skin areas of the interior may reach 700° F. Many other problems, such as vapor barriers, also enter into interior use considerations.

The use of lightweight coated fabric for protective flight suits to provide thermal protection in flight and weather protection in emergency will require a fabric and coating utilizing the best properties of existing materials, but without some of the undesirable features. Another use which will require much development work is for protective suits resistant to the high energy fuels (HEF) for rockets and jets.

In general, the trend for requirements for coated fabrics in the future will be: (1) base fibers with temperature above that of nylon and Dacron,[3] (2) base fibers with lower specific gravity, but the strength of present nylon, (3) fibers with greater ultraviolet light resistance, (4) elastomers or plastics with higher temperature resistance, and (5) elastomers or plastics with a greater density to prevent heat diffusion to base fabrics.

"Design for Climatic Extremes," by Austin Henschel, QR&EC.

This report takes into account the two major problems of climatic variations and extremes with regard to coated fabrics. First is the effect of the climate on the material itself. Many items must be used or stored under many different conditions. The second problem is the effect of the material on the physiological problem of maintenance of body heat balance when coated fabrics are being worn.

While man has survived short exposures as low as —105 and as high as 250° F., the body temperature must be kept in a rather narrow 95 to 104° F. range. This imposes serious problems on the designer to provide the necessary physiological conditions while providing the proper protection. Along with temperature extremes must be included such other conditions as wind, snow, dust, humidity, atmospheric pressure, and other environmental factors. Studies are being made now to get data on the duration and frequency of these extremes in climatic factors to provide the designer with practical yardsticks in the future.

"Interactions of Fabrics and Coatings," by Milton M. Platt, Fabric Research Laboratories, Dedham, Mass.

While not too much information has been produced by investigations or has been publicized on the interactions of coatings and fabrics, the author does go into some detail on the effect coatings have on tear strength of the finished material. The tear resistance of a fabric is described as being a tensile rupture of the yarns being torn. The threads originally at right angles to the direction of subsequent tear attempt to orient themselves, as the load

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increases, in a direction parallel to the tear. This reaction means that the total tear value is dependent on the number of threads bearing or partially bearing the load. It also means that anything which prevents more threads from participating in the load carrying will reduce the material's tear strength.

The structure of the fabric influences the mobility of the threads to slip over one another and thus provide more threads at the tear for added strength. This also applies, then, to the coating. If the coating prevents additional threads from bearing some of the load without adding enough extra strength to make up the difference, the net result will be to lower the tear resistance. Thus the properties of the coating are of considerable importance in the combined properties of the final coated fabric.

Tear resistance is not the only effect which depends wholly or partly on the interaction of the coating and the fabric, but was used as the illustration. The tensile behavior of the fabric can be affected; the flex, or even just the bending characteristics of the material, will also depend on this interaction. Systematic long-range research is the suggestion of the author to help answer some of the questions raised on the basis of the limited work to date.

Session No. 2

The second technical session was also moderated by Dr. Backer and consisted of two papers on design and construction and new fibers and yarns for fabrics for coating.

"Fabrics for Coating—Design and Construction," by W. A. Corry, The Landers Corp., Toledo, O.

Assuming an ideal where the fabric engineer is able to take a slide rule, physical property tables, pencil, and paper and construct an ideal fabric for a given end-use, the author gives an idea of how close this goal is and of some of the problems still to be solved.

Some of the more important characteristics of a coating fabric are: (1) breaking strength, (2) weight, (3) cost, (4) tear, and (5) fabric tightness and bulk. These properties can be engineered with varying degrees of accuracy. Strength, weight, and cost are quite easy to figure or at least to estimate very closely. Tear is a little more difficult, for several variables affect tear and must be considered. The coating itself will cause a change in the tear strength. The degree of "strike through" or penetration has a great effect along with the weave, thread count in each direction, smoothness of yarn surface, and degree of yarn twist.

The fabric thickness and tightness are among the most important characteristics to be considered and in many cases are very hard to figure or predict. The report gives several equations for figuring diameters of yarn, effective yarn width, yarn spacing, minimum fabric thickness, and cloth cover factor.

Two important practical problems in coating, as seen by the author, are, first, those factors which produce knots and slubs in fabrics are poisonous to coaters, and, secondly, any factor which produces tight selvages or bagginess in the goods is certain to cause the fabric to be difficult to coat. Even if the fabric design is good otherwise, either of these two faults could spoil the overall coating.

"New Fibers and Fabrics for Coating," by Rexford C. Pike, Du Pont.

This report covers four new fibers for the coating industry and a new method of using fibers as a coating base. The four fibers are: (1) nylon Type 105, 205, or 305, a modification of existing nylons, (2) the standard Type 51 Dacron, (3) a hot-stretched, heat-set Type 51 Dacron, and (4) Teflon[3] TFE-fluorocarbon fiber. The new method concerns the use of the fiber in a paper for coated products. Instead of a woven cloth using yarn the fibers are processed as is pulp into a paper-like product.

The improvement in the new nylon is reported to be in the shrinkage characteristics. The fiber has more uniform shrinkage throughout the supply package and exhibits less shrinkage and more uniform shrinkage during weaving and subsequent coating. Through its use, a coated fabric is produced with fewer puckers.

The regular Dacron fiber, which is commercially available, has good initial modulus, resistance to degradation from acids, ability to withstand shock loads without breaking, and is dimensionally stable in the presence of moisture. Fabrics of Dacron have been coated successfully with neoprene, chlorosulfonated polyethylene, and vinyl compounds.

[3]E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Certain special applications require a fabric which will provide maximum dimensional stability and a very low order of stretch or elongation. By heat stretching and heat setting Type 51 Dacron a fiber is produced which can help satisfy these criteria. An Air Force radome using this type of fiber has been satisfactorily made.

The final fiber discussed is the Teflon TFE-fluorocarbon fiber. This is spun from the resin form and retains the chemical and heat resistant properties of it. The basic Teflon has a very low coefficient of fiber to fiber friction value so that adhesion must be obtained by mechanically napping the fabric surface. With this technique coatings of neoprene, silicone, and Viton A[3] have been made.

Synthetic fiber paper has been made experimentally by substituting nylon, Dacron, and Orlon[3] in place of the wood pulp or rag stock usually used. Paper of 100% synthetic fiber or blends of synthetic fiber with wood pulp or rag stock may be made. Comparisons of these papers with cotton fabric and kraft paper show them to be generally superior to the kraft paper and equal or better in many ways to the cotton fabric. When used as a base for coating, these papers allow a smoother coating to be applied. The coated papers are easily embossed, and the uniformity of product produces excellent dielectric seaming properties.

Session No. 3

The third technical session held on the morning of October 17 was moderated by Dr. George R. Thomas and dealt with some advances in coating materials, problems of the coater, and a discussion of the evaluation of end-items.

"Technical Advances in Coating Materials for Fabrics," by F. H. Fritz, Du Pont.

In this paper the advances made in rubber and plastics coatings over the past 25 years, together with new materials and methods of fabrication that are on the horizon for the coated fabrics industry, are discussed. The first section of the report covers polymers in major commercial use. A brief description of the uses, good and bad properties, and other pertinent facts are given for natural, SBR, butyl, nitrile, and neoprene rubbers, PVC, and (polyvinylbutyral) elastomeric plastics.

A discussion is also included on some of the design criteria which must be taken into account on coated fabrics. These include fabric protection from weather or sunlight, fungus and mildew, low-temperature serviceability, flame resistance, and gas permeability.

The second section of the report goes into some of the newer polymers available for coating fabrics. A listing with the types of uses, some of the beneficial properties, some of the processing characteristics and problems, and some of the drawbacks, is given for Hypalon,[3] urethane polymers, Viton, polyethylene, nylon, and Mylar.[3]

George R. Thomas

A notation is made of the unsupported plastic film type of construction which is providing increasing competition to coated fabric construction. It is conceivable that some fabric support may be incorporated into some of these materials in many cases, however, as time goes on.

"Technical Problems of the Coater," by Joseph L. Haas, Hodgman Rubber Co., Framingham, Mass.

The problems faced by the coater in normal manufacture cover most of the factors discussed in the various papers, this speaker said. The problems start with the fabric selection, continue into the compound formulation and development, and then come to the fore in the coating techniques of the actual manufacturing operations. The machinery used today is basically the same as that used for many years. For the most part knife coaters or calenders are used to put the coating layer on to the fabric. There have been improvements and refinements, but the basic design is the same.

Originally the coater had just natural rubber or perhaps pyroxylin to select as a base polymer and only a few different compounding ingredients to add. Today, with many polymers to use and more coming all the time and with the large variety of compounding ingredients to vary the properties of these polymers, the selection of the proper compound now becomes a major study. Formerly the coated fabrics manufacturer had usually only cotton or silk fabrics to choose from. Today he has many different natural and synthetic fibers and by proper treatment can vary the properties of the fabric as well as the coating.

Along with learning how to select the proper coating and fabric for the end-use, the coating manufacturer had to learn how to process these new materials. The methods used on cotton coated with natural rubber did not always prove to be the best with the new materials. Taking advantage of the best properties of the newer materials required new techniques to keep them in the final product.

The final section of the report deals with a specific case history in the development of a poncho material. The method of selection to meet the required properties are set forth, and some ideas on the way to meet them. While the development is taking place to get fabric and coatings to meet the specification, small-scale trials are also held to be sure the final selection will process properly.

"Evaluation of End-Item Performance," by K. L. Keene, United States Rubber Co., Mishawaka, Ind.

The purpose of evaluating the end-item performance of a product is to assure satisfactory service. The tests set up in a specification should be the result of a thorough study of the conditions under which the product will be used, and, if possible, a study of the material after it has been subjected to actual service conditions.

Laboratory tests do not always furnish sufficient information or accurate enough information to predict the actual service life of a product. Some type of use test should be made to complete the study of a new product. For tarpaulins, as an example, an experimental tarp with alternating panels of a standard and the new material can be made and tried on a truck. Seating materials can be tried on a taxicab for accelerated trials before the product is introduced. Other products usually can be also tried in use.

A few of the tests now being used are suggested as being not too valuable because of a lack of reproducible results. The various abrasion tests were cited as an example of this problem. Most coated fabric specifications carry an abrasion test. It has been found by round-robin tests conducted by ASTM that correlation between laboratories does not exist. Therefore the question of the value of the tests is raised, and it is thus suggested that perhaps these tests should not be included.

A follow-through of the material in actual usage is often required to insure that the service life is as satisfactory as desired. A case illustrating this need came up in rubber-coated protective suits used in a mine. Premature separation was occurring, and a visit to the mine was required before the cause could be found. Oil-lubricated jack-hammers were spraying the suits with oil-laden air and causing the trouble. Using an oil-resistant coating solved the problem which could not have been anticipated

when the suit was being designed. In this case laboratory tests specified did not meet the service requirements.

The conclusion drawn is that laboratory tests specified should be chosen from the list of some 250 or more available tests to simulate as closely as possible the service requirements. These tests should be checked with actual service or use tests, and any tests which cannot be reproduced in various laboratories or do not have a bearing on the service of the product should be eliminated.

Session No. 4

The final session was held on the afternoon of October 17 and was again presided over by Dr. Backer. This session concluded the meeting with talks on the use of butyl in proofed goods, some remarks on specific problems of proofed materials, and a paper on the laminate structure.

"Butyl Rubber in Proofed Goods Applications," by S. R. Shuart, Enjay Co., Inc., Linden, N. J.

A few of the applications which make use of the properties of butyl rubber are automotive convertible tops, portable swimming pools, upholstery fabric, flexible pipe and canal liners for irrigation purposes, chemical-resistant clothing, rainwear, and air mattresses. Weatherability, ozone resistance, heat resistance, and the gas permeability properties of butyl are among the most important reasons for its use.

One new development which has been of great importance to the proofing industry is that of a butyl latex that can be employed to achieve high levels of adhesion to fabrics. This latex is available at a 55% total solids concentration and in combination with resorcinol and formaldehyde in water makes a dip which improves adhesion greatly.

Another new development is a halogen-containing polymer. Designated MD 551,[4] it is reported to have even greater ozone and chemical resistance, and to cure faster than the conventional butyls, with a variety of cure systems including non-toxic systems.

"PVC and Nitrile in Proofed Goods," by L. L. Shailer, Jr., B. F. Goodrich Chemical Co., Cleveland, O.

A brief discussion on the use of PVC and nitrile polymers for solving fungus resistance, gas permeability, and moisture vapor transmission, and a brief description of some newer materials in this field for coating materials are included in this paper.

The fungus resistance of PVC is quite well known and is so good that the resistance of its compounds is dependent upon the plasticizers used. The plasticizers also greatly influence the permeability of PVC, and since low-temperature plasticizers appear to be somewhat poorer, compounding for permeability must be done carefully.

A little known or at least little exploited characteristic of the nitrile rubbers is the low permeability property. Most of the work to date has been done on thin films so that much work should be done on coated substrates to determine how this property can be utilized most successfully.

Newer polymers in the nitrile or related family are the polyacrylic elastomers and the carboxylic nitrile. These are designed as Hycar 4021[5] and Hycar 1072,[5] respectively. The polyacrylic is recommended for high heat service, and the carboxylic nitrile for higher oil or ozone resistance.

"The Laminate Structure," by D. H. Schafer, Weblon, Inc., North Abington, Mass.

The use of synthetic fibers with a calendered vinyl film to form a coated fabric has produced particular problems. The method first used to put vinyl film on cotton with heat to marry the two into a unit would not work with synthetic fibers.

It is necessary to use a scrim or open-weave fabric so that with just the right amount of heat and pressure to provide tack, the sandwich around the fabric is formed and adheres by contact adhesion through the interstices of the fabric as well as by direct adhesion to the fabric. This produces a film of uniform thickness, homogenous, and free from solvent holes. It is expected that increased lamination technology will allow the use of standard coating fabric along with the open weave, but at present this situation does not hold.

[4]Enjay Co., Inc.

[5]B. F. Goodrich Chemical Co.

New Polymer Talk

The Northeastern Section of the American Chemical Society held its December 12 meeting in Huntington Hall, MIT, Cambridge, Mass. Following the dinner in his honor, Dr. Herman F. Mark, Polytechnic Institute of Brooklyn, Brooklyn, N. Y., spoke on "New Polymers and New Concepts in Polymer Chemistry." The talk covered present and future stereoregulated polymers and their production, the use of less reactive catalysts in these processes, and of bifunctional monomers in polyester, polyamide, and polyurethane formation in interface polymerization.

Dr. Mark spoke of methods to determine specific orientation within molecules and studies of the helical structure of vinyl-type polymers. He said he believed that polymers produced with highly efficient polybutadiene catalysts in combination with copolymers of ethylene, propylene, and butylene would become the cornerstone of rubber technology in the future.

Professor Mark concluded by indicating that polyether and polysulfide "block"-type condensation polymers such as Thiokol[1] polysulfide rubber reactive-end blocks expanded with diamines, polyamines, or carboxyacid anhydrides to form solvent-resistant filaments, fibers, and rubber products would also be of major importance in the future.

[1]Thiokol Chemical Corp., Trenton, N. J.

Boston RG Party

About 600 members attended the Boston Rubber Group's annual Christmas party on December 12, at the Hotel Somerset, Boston, Mass. The Group enjoyed a cocktail hour followed by dinner, and the evening was completed by excellent entertainment and the drawing of door prizes for the lucky.

The only attempt at conducting any business was a presentation of the officers for the new year. The retiring chairman Roger L. Steller, B. F. Goodrich Chemical Co., Boston, turned the meeting over to Ralph B. Huber, R. B. Huber, Eng., elections committee chairman. Mr. Huber announced the results of the elections and introduced: chairman, William H. King, Acushnet Process Co., New Bedford, Mass.; vice chairman, James J. Breen, Barrett & Breen Co., Boston; secretary treasurer, George E. Herbert, Tyer Rubber Co., Andover, Mass.; executive committee, John M. Hussey, Goodyear Tire & Rubber Co., Boston, George Hunt, Simplex Wire & Cable Co., Cambridge, Mass., Mr. Steller, and an education chairman to be appointed. Harry A. Atwater, retired, is permanent historian.

Mr. Breen reported to the group that plans were complete for the ski outing week-end at Bartlett, N. H., on February 6, 7, and 8 and urged early registration.

Vented Mold Patent

Hooker Chemical Corp., Niagara Falls, N. Y., has been issued United States patent No. 2,865,052 for "Vented Mold for Plastic Materials" invented by the late Grayson W. Wilcox, Durez Plastics Division sales. The invention relates to a vent plug for mold cavities which releases the gases automatically to prevent distortion or "doming" of the molded piece. The patented device is being manufactured and marketed by Alpha Screw Co., Arlington, Mass., under license from Hooker Chemical Corp.

Seventh Wire, Cable Symposium Held

The U. S. Army Signal Research & Development Laboratory at Fort Monmouth, N. J., again played host for the seventh annual symposium on "Technical Progress in Communication Wires and Cables," which is sponsored jointly by industry and the laboratory.

The meeting which drew more than 1000 delegates from manufacturers and suppliers, was held at the Berkeley-Carteret Hotel, Asbury Park, N. J., December 2, 3, and 4.

Committee Chairmen

The chairman for the symposium was H. L. Kitts, and co-chairman was H. F. X. Kingsley, both of the signal laboratory. Both men have been associated with the symposia of the past, and a feature of the banquet was the presentation of a memento to Mr. Kitts, who will be unable to serve as chairman of the eighth symposium owing to a change in duties. Mr. Kingsley will become chairman for next year.

Other committee members, who served as moderators for the five technical sessions, were C. T. Wyman, Bell Telephone Laboratories, Inc., Kearny, N. J.; M. G. Caine, Monsanto Chemical Co., Springfield, Mass.; A. L. McKean, Habirshaw Cable & Wire Division, Phelps Dodge Copper Products Corp., Yonkers, N. Y.; J. L. Robb, Superior Cable Corp., Hickory, N. C.; and B. Levinson, The Okonite Co., Paterson, N. J. Another member of the committee was R. Blain, U. S. Army Signal Agency, Arlington, Va.

At the start of the first technical session Col. H. McD. Brown, Commanding Officer at Fort Monmouth, made a short welcoming address. Along with the technical sessions there were the suppliers' hospitality hour on December 2 and the banquet on December 3, both providing very pleasant social interludes.

Papers of Interest

Twenty-three papers were given at the meeting and were well received. Those of interest to the rubber and plastics industries particularly are summarized below.

"Effects of Plasticizers upon Dry Blending Polyvinyl Chloride Resins." Russell A. Park, Firestone Plastics Co., division of The Firestone Tire & Rubber Co., Pottstown, Pa.

This paper dealt with plasticizers in the concentrations most often encountered in the calendering, dry blend extrusion, and injection molding fields, that is, 20 to 50% by weight of plasticizer on the resin. The author explained the basis used by Firestone to evaluate resins for adsorptive and absorptive character and the use of a Day[1] mixer test to obtain a measure of dryness after adsorption and absorption have taken place. This Day mixer test also furnishes two reference points: (1) the *appear dry time* and (2) the *fluff time*. The appear dry time is the initial period after the addition of the plasticizer when the hot plasticized blend begins to fall freely from the mixer blades. The fluff time is the initial period, after the adding of plasticizer, when a resin changes its bulk density.

The paper also covered the pressure stain test and its value and then discussed compatibility and solvent action of the plasticizers and how these affect the action of the plasticizer in the blend.

The report gave illustrations of the ring or straight chain character of plasticizers and the relation with dryness or absorptivity rates. This relation is used to predict the behavior of new plasticizers. There is described also some work on how lengthening the chain affects the solvent power of the plasticizer.

The use of Banbury fusion characteristics to evaluate resins was also explained. In one example cited, a synthetic hydrocarbon oil used failed to follow the expected behavior as predicted by the chemical structure as just discussed. Some plasticizers with somewhat obscure structures cannot be counted on to follow regular behavior patterns, the author said.

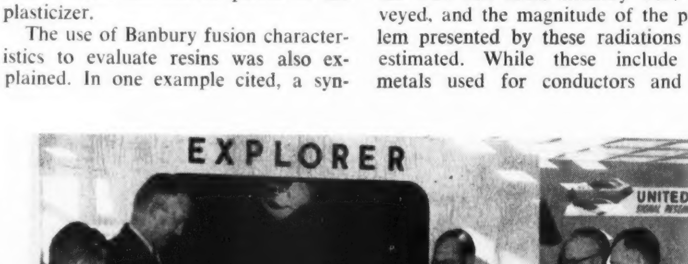
The efficiency of a plasticizer refers to the relative ease with which a plasticizer will soften a polymer. A listing of the many ways and methods of test to determine this efficiency was given in the paper.

Finally, several pages were devoted to tables listing the properties of various Exon[2] PVC resins with various plasticizers.

"Nuclear Radiation, a New Environment." C. J. Lyons and R. I. Leininger, Battelle Memorial Institute, Columbus, O.

In recent years a new environment, nuclear radiation, has been added to the more familiar ones such as temperature, moisture, and ultra-violet. The importance of this new environment is increasing as atomic energy is harnessed for power production and the propulsion of ships and aircraft.

The effects of the different types of radiation on materials of interest to the wire and cable industry were surveyed, and the magnitude of the problem presented by these radiations was estimated. While these include the metals used for conductors and for



Shown looking at a model of the Explorer space satellite and listening to its tape recorded signal in an exhibit at the Wire and Cable Symposium are: (*left to right*) G. A. Hathaway, exhibits senior project officer; Col. H. McD. Brown, commanding officer; Howard L. Kitts, chairman, symposium committee; Col. H. E. Price, director, communications department; and H. F. X. Kingsley, co-chairman, symposium committee; U. S. Army Signal Research & Development Laboratory, Fort Monmouth, N. J.

[1] J. H. Day Co. Division, Cleveland Automatic Machine Co., Cincinnati, O.
[2] Firestone Plastics Co.

sheathing materials there were listed in this paper most of the commercially available rubbers and plastics with individual comment on each in regard to the radiation resistance.

Based on the work to date the authors made the following general statements: (1) Conductors, being metallic, are comparatively little affected by radiation. Resistivity and mechanical properties such as modulus and hardness are somewhat increased, but not to the point where their utility is impaired. (2) Organic materials such as plastics, rubbers, and coatings vary from poor to moderate in resistance to irradiation. (3) Plastics and rubbers may be roughly divided into two classes: those whose molecular weight is degraded, and those that cross-link or vulcanize under the effects of irradiation. Generally, those that cross-link maintain their usefulness longer. (4) During irradiation, the resistivity of insulators decreases appreciably as much as several orders of magnitude. In some cases, this decrease persists for protracted periods after irradiation. (5) There is an interaction between radiation and other environmental factors such as heat. Insufficient work has been done to establish the degree of interaction.

The major portion of the paper was divided into two parts. One part dealt with metallic materials, and the other with non-metallic materials. The non-metallic section is further divided into the effect of radiation on specific elastomers and the effect of radiation on specific plastics. Additional sections were included on the limited amount of work done on actual use tests of wire and cable and on electrical components.

"The Effects of Radiation on Silicone Rubber Wire and Cable Insulation." C. G. Currin, Dow Corning Corp., Midland, Mich.

In this paper, also dealing with radiation effects, the study was concerned with the one elastomer, silicone rubber. Since insulation utilizing silicone rubber met the three basic requirements of nuclear service of reliability, thermal stability, and moisture resistance, the only unknown was its resistance to the radiation. This is the area of study covered by this report.

Some of the work was done on standard slab samples of silicone rubber insulation, but much work was also done on samples of insulated wire in order to determine the extent of correlation with results obtained on the slab samples. The study was made using a multikilocurie Cobalt 60 gamma radiation source. Most of the experiments were run at 250° C., but some work was also done at 200° C. in a small oven.

The basic effects on silicone rubber were described as being due to ionization, charged particles, or free radicals, being produced throughout the elastomer. In silicone rubber these charged particles disappear within a second after irradiation, thus affecting the material only during exposure. The physical properties are apparently permanently affected, but the dielectric properties are generally affected only during irradiation.

One of the conclusions drawn was that silicone insulation could be effective for a number of years, depending upon the radiation intensity involved and upon the amount of flexing the insulation experienced in service.

"New Extrusion Techniques with Silicone Rubber." H. H. Bashore, C. E. Simpson, E. G. Schwarz, Silicones Division, Union Carbide Corp., New York, N. Y.

This study introduced a concept of processing silicone rubber called direct feed. It has been necessary in the past to plasticize or warm-up the silicone rubber before it could be extruded. This step also had to be repeated if a delay was encountered which prevented the plasticized stock from being used almost immediately. Now the claim is made that these new elastomers may be fed directly from the delivery package. These direct feed compound strips are furnished in a crushproof box, dusted, and ready for use. Shelf life is estimated at several months although the normal good practices in regard to elastomer storage are recommended.

The report also gave information on pelletized silicone rubber compounds which also can be used directly from the shipping container without additional processing. The pellets are made in the form of cylinders about ¼- by ⅜-inch long and are dusted to prevent sticking.

These direct feed compounds are primarily designed to be of use to the wire industry, but they have also been successfully used in the transfer and injection molding of other silicone rubber products.

"Evaluation of Multi - Conductor Cables Used in Ground to Air Guided Missile Systems." T. J. Horan and J. J. Roache, Frankford Arsenal, Philadelphia, Pa.

The existing specification MIL-C-13777 (Ord) A June, 1957, for cable designed to connect the various ground installations for fire control or guided missile systems has been quite restrictive with regard to the materials allowed for use in the cable's construction. Since many cable manufacturers felt they could meet the specification with other materials, the U. S. Army Ordnance Corps set up an evaluation program to determine if other materials could be used. Manufacturers were invited to submit cable, with the only restriction being that it had been subjected to the required tests and had met the minimum requirements. The Frankford Arsenal then retested the cable for conformance.

The report described the various tests conducted including one to simulate the rough treatment this type cable gets in field use. Cold bend, water absorption, high pot, and insulation resistance were the other tests performed.

The conclusion drawn was that there were other constructions as well as that spelled out in the specification which would be satisfactory, and the specification is being revised.

"Rodent Attack on Rubber and Plastic Insulated Wires and Cables." B. F. Lizell and J. S. L. Roos, Sieverts Kabelverk AB, Sundbyberg, Sweden, and G. R. Björck, Kungl. Veterinärhögskolan, Department of Animal Husbandry, Stockholm, Sweden.

Rodent attack on different rubber and plastic materials was investigated. The tests were made partly on cylindrical samples and partly on insulated cables with and without various additives tried as rat repellents. White rats were used and had normal amounts of water and feed. While the authors admit that perhaps some questions could be raised about the number of tests run, the samples and their preparation, and the animals chosen, they feel that the results are quite conclusive in that only metal-clad cable is safe from attack. There appears to be some benefit from additives, but those tried to date do not offer complete protection. There appears to be a lessening of attack with harder materials, but all rubber and plastic materials were attacked.

The authors concluded that rats, being playful and inquisitive animals, attack materials which have no functions as food or which can be used as teeth-sharpeners. None of the materials tested was ratproof. Rigid types of plastics will probably be damaged only to a small extent. Metal sheathing is required for complete protection. Lead, however, is no hindrance to attack.

The report leaves a very important challenge to the chemical industry to find an additive which will prevent attack while still maintaining the lower cost of the non-metal-clad cable.

"Enjay Butyl in Low-Voltage Applications." W. F. Fischer and W. C. Smith, Enjay Laboratories, Inc., Linden, N. J.

While butyl rubber has been used for high-voltage applications for some time, it has been limited in low-voltage applications (less than 600 volts) mainly because it has not been too successful in CV (continuous vulcanization) cures. This report gave the results of development work on two compounds: a black compound satisfactory for low-voltage block (telephone ringing circuit) and power wire insulation, and a light-colored compound which serves

as color-coded insulation for multi-conductor drop (pole to house) wire.

These compounds feature a one-step extrusion which is attractive in comparison with the two-step insulation-jacket process used with other materials. They have also been successfully run at speeds of 300 to 350 feet per minute in CV cures.

The report discussed the steps taken in developing these compounds and the results obtained. The major problem lies in providing the proper combination of physical properties, electrical characteristics, and ozone resistance while attaining a satisfactory continuous extrusion cure rate. Several cure systems and filler systems were tried along with antiozonant and wax protection to increase the age resistance of the jacket.

The only feature of these compounds not fully checked out was the long-term use tests for exposure resistance. Since these types of wire are expected to last periods of time such as 15 or 20 years, these agings will be continued for many years.

The conclusions drawn are that these two butyl rubber compounds, one black and one colored, meet initial physical and electrical requirements for low-voltage insulation. Tests and factory trials indicated that these compounds were superior in some ways to the present compounds used and that they should be competitive economically. Only long-term weatherability experience still needs to be proved.

"Influence of Water Immersion on Electrical Characteristics of Silicone Rubber." M. G. Noble, General Electric Co., Waterford, N. Y., and W. L. Seamonds, Simplex Wire & Cable Co., Cambridge, Mass.

In the wire and cable industry silicone rubber has been used for high-temperature applications, while in other fields engineers have used silicone rubber for moisture resistance. This study was made to evaluate the combination of these uses aimed at developing a wire insulation of silicone rubber for water immersion.

The study attacked the problem in two ways. One was concerned with determining what variables influence the performance of silicone rubber in wet locations, and the other with what limitations are revealed by long-term immersion of silicone rubber in water.

For the first evaluation four variables were studied: filler selection, voltage during immersion, insulation wall thickness, and immersion test temperature. As would be expected, all of these variables exert significant influence on the electrical properties of silicone rubber insulated wire in water immersion tests. The results of these tests were presented in full in the paper.

Cables were prepared which would be suitable for 5-kv. power cable service and subjected to water immersion tests. The results of these tests indicate that silicone rubber insulated wire and cable are suitable for wet locations. Some compounds have served for 4½ years and passed a 5-kv. ac. voltage test after soaking in 70° C. water. Tests run with 90° C. temperature water, however, did not last so long, and the recommendations suggest that silicone rubber insulation not be used for more than very short periods in the higher-temperature water.

"Flame Retardant Polyethylene for Wire and Cable." R. C. Graham, Rome Cable Corp., Rome, N. Y., and C. A. Neros, Diamond Alkali Co., Painesville, O.

When polyethylene was introduced about 15 years ago, it was humorously described as looking, smelling, and *burning* like a candle. While this description may not have been completely true, the industry has been trying for many years to give added flame resistance to polyethylene insulation.

This paper dealt with a study using chlorinated paraffins to obtain this flame resistance. These chlorinated paraffins were used during World War II by the Armed Forces in flame-proofing canvas duck, but following the war the demand for chlorinated paraffins virtually disappeared and new uses had to be found. These two problems, flameproofing the polyethylene and using the chlorinated paraffins, were merged with fairly successful results.

Two tests were used to evaluate the flame resistance: the vertical test of ASTM D 635-44[3] and the horizontal test of the Underwriters' Laboratories.

Loadings on polyethylene up to 36% with proper ratios of chlorinated paraffin to antimony trioxide produce wire coating compounds meeting the desired levels of flame retardancy as described in the tests. The use of high molecular weight polyethylene improves physical characteristics of the resultant mixture. The addition of small quantities of butyl rubber to the extent of about 5% on the polyethylene further improves properties so that the final compound more closely exhibits the original performance characteristics of the polyethylene resin.

The authors further point out that the future of this procedure in obtaining flame-retardant properties holds considerable promise for other polyethylenes, such as linear and possibly cross-linked varieties as well as for other polyolefins.

"Measurement of the Degree of Dispersion of Carbon Black in Polyethylene Using Absorption of Light." George G. Cocks and Alfred P. Metzger, Battelle Memorial Institute.

One source of degradation of polyethylene is light. This photodegradation can be minimized by shielding the plastic from the light. This has been accomplished by incorporating carbon black into the mixture, but the degree of dispersion has a great effect upon the success of the addition.

Attempts to measure and test for this degree of dispersion have not produced the desired correlation between test results and experience. The object of this study was to examine these tests based upon the absorption of light and try to identify and eliminate the variables which were preventing duplicability of results between laboratories.

It was found that the light transmission through a film of black polyethylene is affected by several variables in addition to the degree of dispersion. These include: (1) the particle size of the carbon black, (2) the thickness of the film, and (3) the area under examination. The wave length of light is suspected of having an effect also, but this will require more work to establish firm conclusions.

Federal Specification L-P-590 apparently recommends an instrument which scans too large an area. The experimental results indicated that the area under examination has a strong influence on light-transmission values. Variations in transmission are averaged to a greater degree when the area is relatively large. It appears that this averaging of transmission data tends to obscure the desired measurement. Measurements made on areas of film in the order of two microns in diameter seem to be indicative of the weathering properties of the compound.

The authors concluded that the existing tests do not give the necessary results. They suggested that additional work is necessary to evolve an effective test and that a revised standard method for determining absorptivity should be developed.

"Microdensitometric Determination of Dispersion." W. G. Best and H. F. Tomfohrde, III, Union Carbide Plastics Co., Bound Brook, N. J.

Another method proposed for determining the degree of dispersion of carbon black in polyethylene is a microdensitometer test. The basic principle of operation of the equipment used is a finely focused beam of light 10 microns in diameter which scans the test specimen. This microspot of light is then viewed by a sensing microscope at a magnification of 100 diameters. The beam falls on a photomultiplier, is amplified, and then fed to a suitable recorder.

This study described briefly a potential method and apparatus for the measurement of carbon black in polyethylene which is free of empirical influences, more reliable and precise, and less time-consuming than some existing tests. Testing done so far indicates that with more precise instrumentation it should be possible to measure carbon

[3] American Society for Testing Materials, Philadelphia, Pa.

black dispersion and gels independently and to determine, electronically, a dispersion index.

It is the hope of the authors that others will evaluate this test to establish better its practicability as a standard for measuring carbon black dispersion in polyethylene.

"Electron Processing Techniques for Wire and Cable Irradiation." D. A. Trageaer, High Voltage Engineering Corp., Burlington, Mass.

The radiation cross-linking of elastomers and of polyethylene has been studied intensively in the last few years. The beneficial properties produced have been reported by a number of investigators. There are already some commercial processes based on the irradiation of polyethylene-coated wire and also tape for the wrapping of coils and cable. At this time only the high-energy beams from electron accelerators have enough compacted radiation power and efficiency of application to be of economic interest for present and future applications in the wire and cable industry.

This report covered some of the methods and problems presented in this type of process. The major problem is the geometry of penetration for wire, that is, the method of utilizing all the energy without wasting it passing through the conductor or escaping past the edges. Double-sided treatment and rotary treatment were proposed to meet this problem.

A wide range of wire and cable sizes can be processed continuously with various engineering techniques. The choice of technique depends on the wire geometry and beam energy. These two factors also significantly affect the process efficiency and, hence, the production rate and cost.

Single-sided treatment is restricted to very small wires, and the efficiency is very low. Double bombardment, however, can be used on a wide variety of wire sizes. Rotary treatment increased the efficiency even more than double-bombardment and is most suitable for large cables.

"Carbon Black Loaded Cross-Linked Polyethylene in Wire and Cable." B. B. S. T. Boonstra, Godfrey L. Cabot, Inc., Boston, Mass., and Allen C. Bluestein, Anaconda Wire & Cable Co., New York, N. Y.

Normally the addition of carbon black to polyethylene in any amount in excess of the two to five parts for light protection produces a compound which is very brittle and of little use. Chemical cross-linking simultaneous with the incorporation of the carbon black has modified this brittleness so that usable products result. New work with the organic peroxides has given cross-linked polyethylenes with reduced plastic flow and shrinkage. It has been found that these cross-linked polyethylene compounds may contain as high as 200 parts of medium thermal black with excellent results.

The reason given for this effect is the reduction in the tendency of cooling polyethylene to form crystals. The compound containing the organic peroxide when heated to the reaction temperature of 350-400° F. to induce cross-linking and then cooled, does not form so many crystals.

These compounds may be handled on normal rubber and plastic machinery, and by varying the amounts of black and peroxide, modifications may be made in properties to fit specific requirements for one or more compound requirements for wire and cable use.

Conclusions drawn were that although the carbon black loaded, chemically cross-linked polyethylene compounds are not the best in every test comparison made, they show a remarkable combination of desirable properties of interest to the wire and cable industry. The authors fully expect further investigations to open up new applications for this versatile new material.

"Chemically Cross-Linked Polyethylene." E. R. Kerwin, General Electric Co., Bridgeport, Conn.

This report presented data on a thermal carbon black loaded, chemically cross-linked polyethylene. This material, called Vulkene,[4] was checked against neoprene and polyethylene to IPCEA[5] requirements for service drop and secondary cable. The cross-linked polyethylene proved to be better in overall resistance to ozone, stress cracking, weathering, low temperature, heat, and moisture. It also proved very good in its resistance to overloads and to short circuits. Abrasion, impact and chemical resistance are very good in this cross-linked type of polyethylene. It was virtually unaffected by a large number of reagents employed in the tests and was given an excellent rating in chemical resistance.

Although the electrical properties of the compounds of cross-linked polyethylene do not equal those of conventional polyethylene, they are comparable, and the overall properties are superior to those of many thermoplastic and thermosetting insulations used in a wide variety of applications. Significant advantages can be realized with Vulkene in installations involving one or more of the following conditions: (1) overloads and short circuits; (2) high ambient temperatures; (3) exposure to solvents and chemical reagents; (4) abrasion and impact problems; (5) low-temperature operation, particularly where impact is a problem.

The potential of these cross-linked polyethylenes still is to be fully developed. Compounding and the use of other cross-linking agents should increase greatly the use of cross-linked polyethylene. Line wire, control cable, power cable, and hook-up wire are all being studied. Coloring and striping do not seem to present any problems although the actual manufacturing of these styles still is to be proved out.

The verified heat stability and mechanical properties even in this present stage of development warrant the consideration of chemically cross-linked polyethylene by the wire and cable industry.

[4]General Electric Co., Schenectady, N. Y.

[5]Insulated Power Cable Engineers Association, G. M. Haskell, Secretary, 283 Valley Rd., Montclair, N. J.

SAACI Elects Spencer

The Salesmen's Association of the American Chemical Industry, Inc., elected and inducted into office as president, James E. Spencer, of Harshaw Chemical Co. The Association's annual induction luncheon was held January 20 at the Hotel Commodore, New York, N. Y.

Other officers elected for 1959 are: vice president, George W. Poland, Jr., of E. M. Sergeant Pulp & Chemical Co.; treasurer, Preston F. Tinsley, Westvaco Chlor-Alkali Division, Food Machinery & Chemical Corp.; secretary, Stewart Cowell, J. T. Baker Chemical Co.

Elected to the board of directors were: James M. Fergusson, Sumner Chemical Co.; John M. Glaze, Hooker Electrochemical Co.; Paul E. McCoy, American Potash & Chemical Corp.; Frank Reynolds, Publicker Industries; William Wishnick, Witco Chemical Co.; and Walter H. Farley, Chas. L. Huisking & Co.

Buffalo RG Officers

As part of the Buffalo Rubber Group's annual Christmas party, the election of officers was held. The meeting took place at the Buffalo Trap & Field Club, Buffalo, N. Y., on December 9. The elections were held immediately after the dinner, and the results announced following the entertainment. The party then closed with the distribution of Christmas gifts to every one of the approximately 250 members and guests present.

The officers elected for 1959 are: chairman, Richard J. Herdlein, Hewitt-Robins, Inc., Buffalo; vice chairman, Lawrence J. Halpin, Dunlop Tire & Rubber Corp., Buffalo; secretary-treasurer, Edward Sverdrup, U. S. Rubber Reclaiming Co., Buffalo; directors to serve three years, Robert Hirschbeck, Pierce & Stevens Chemical Corp., Buffalo, and James H. Lorenz, Union Carbide Silicones Division, Tonawanda.

Business Operations and Testing Symposia of Southern Group—II*

"Physical Testing"

The abstracts of the papers presented and the questions and answers for this second session are given below.

"Specification Compounding," B. W. Habeck.

Using the nitrile rubbers as the example of specification compounding the common types of specifications encountered are: (1) military, (2) ASTM[1] D 735 Class SB type; (3) various company specifications, and (4) SAE[2] Aeronautical Materials Specifications (AMS).

Most of these specifications require severe service conditions be met and so list laboratory tests in fuel, oil, coolants, high and low temperature, and others which make the compounders job quite exacting. In order to do this job satisfactorily the compounder uses three methods which are common to the solution of any problem: first, knowledge of the rubbers and materials to be used—commonly called experience; secondly, statement of the problem—requirements; and, finally, application of the experience using common sense to obtain the solution.

These steps apply to the compounding of any type of elastomer. The selection of the proper grade of nitrile for low-temperature requirements as well as oil resistance, the selection of a blend of reinforcing pigments to supply needed quality, selection of plasticizers for the swell, temperature, and/or leaching to give properties as specified, and the use of accelerators and vulcanizing agents to complete the formula and meet an AMS-7274C specification were described in some detail.

In nitriles, as well as all other polymers, specification compounding is a dynamic science. New requirements and new polymers are appearing on the scene almost daily. Therefore, one cannot afford to stop with today's knowledge, by tomorrow it may be out of date, it was concluded.

Q. Are the vulcanizate tests established under the former Government Synthetic Rubber Program considered satisfactory for material control of SBR polymers in tires and other products? If not, what suggestions can be made?

A. In general, present tests based on the former government tests do a good job. However, consideration is being given to a change to a HAF black formulation for some SBRs.

There are two important questions that are constantly being raised by users of SBR: *color* and *processibility*. Present testing does not tell us about color, the discoloration, or the staining of polymers; nor do these tests tell us much about the processibility of the polymers.

A number of processing tests are being investigated. One of the panel members mentioned one company is using a Δ-Mooney test which is reported to measure processibility. At the fall meeting of the Rubber Division, ACS, in Chicago, K. C. Beach, of Goodyear, presented a paper on a processing test for SBR polymers. Beach reported that Goodyear is incorporating this processing test with other control tests on SBR polymers.

The processing test being used by Goodyear is based upon the mixing of a 50-part HAF black formula, plus zinc oxide and stearic acid, in a Banbury, with careful attention being paid to the power chart. Time is measured from the dropping of the ram on to the black until the second peak of the power curve is reached. This time was found to correlate well with processibility; longer times indicated poorer processing properties. Goodyear plans to use this test to control more closely the manufacture of its polymers.

Q. From the purchasing point, what suggestions can be made to the SBR suppliers in general?

A. This question ties in with the previous one. The panel feels that uniform processibility is probably the most mentioned problem of the producers. If producers can supply buyers with uniform easy-processing polymers without too much sacrifice of other properties, one of their major hurdles will be overcome.

A second problem which the panel felt the producers have is that of supplying light-colored, non-staining, non-discoloring polymers.

"Physical Testing of Tires and Other Rubber Products," R. G. Dunlop.

The subject of physical testing is considered under the following headings: the scope, purpose, pitfalls, problems, and challenge.

The scope includes even the thumbnail, tearing, and biting tests of the old-time technician, along with the most complex equipment and procedures to test and evaluate elastomers.

The three broad purposes of physical testing are: control, development, and comparison. Most rubber plants will do some testing in one or more of these areas, no matter how small they may be.

The pitfalls fall under headings of precision and detail. Many of the so-called discrepancies between labs usually clear up when adequate attention is paid to precision and detail. It is in this area that the well-laid-out test procedures of groups such as the American Society for Testing Materials find so much acceptance and success.

The problems of testing are the well-known problems common to most enterprises: the obtaining of equipment, obtaining and training of personnel, and daily functioning of the unit. The common practice of using the testing department as a training

*Concluded from our Jan., 1959, issue, p. 551.

[1] American Society for Testing Materials, Philadelphia, Pa.

[2] Society of Automotive Engineers, New York, N. Y.

Panel on "Physical Testing" *(left to right):* N. Penfold, P. W. Libby, M. F. Torrence *(standing)*, R. G. Dunlop, B. W. Habeck

ground for new technical personnel is fine for the man, but detrimental to an accurate and efficient physical testing program. There is no substitute for a well-trained operating technician.

The challenge to physical testing is also no secret to most people involved. To devise new tests, improve old ones, and make better use of existing tests is a wide open field. The tools that solved problems in the rubber industry 20 years ago will not solve all of today's problems. We must face the problems of low temperature, high temperature, high ozone, high radiation, high speed, etc., and come up with adequate physical tests to control, develop, and compare in our day, it was said.

Comparative testing of tires and other rubber products by the Smithers Laboratory was also described as a part of this paper.

Q. Discuss laboratory evaluation of tires considering various groups of oils used in SBR types.

A. In our laboratory evaluation of tires we have no means of determining the types of oil that may be used in the SBR rubber. We determine the acetone extract of the various rubber components which will indicate the extent of the use of oil, but not the type of oil. I don't think any of the measurable physical properties normally included in a laboratory evaluation will indicate type of oil used.

If indoor wheel tests are included in a laboratory evaluation, the effect of various types of oils on tread and splice separation probably would be observable, particularly if a natural rubber top ply or cushion is used. This failure can be accelerated by heat aging the tire before test.

"Flexometer Testing," M. F. Torrence.

By common usage, the term flexometer has been limited to those flexing machines which rapidly flex samples under compression, shear, or both, in such a manner that the hysteresis results in heat buildup or temperature rise of the sample. Generally the results are measured as temperature rise or time to disintegration of the sample. Some other observations, such as permanent set and modulus changes, are frequently of interest, but the actual measurement of hysteresis loss is generally of secondary importance.

Heat build-up in a stock, both in service and in the laboratory, is influenced by many factors other than resiliency. The thermal conductivity, modulus, and whether the stock is distorted under constant load or constant deflection, often have more effect than the actual hysteresis. The effect of thermal conductivity can be practically eliminated since it is so low for all elastomers, but the effects of modulus have a very large part in the heat build-up.[3]

There are many different types of flexometers, but three have been used with sufficient acceptance that they have been described in ASTM procedures. They are the Goodrich, the Firestone, and the St. Joe machines. Two others, the Goodyear and the Dunlop, have also been used quite a bit.

The heat build-up of an elastomer is dependent on many factors, but, in all cases, it is the result of hysteresis. The service conditions involved should be carefully considered before selecting a test and interpreting the results. If the force is constant and the amplitude varies, the heat build-up decreases with increased modulus. These conditions are obtainable on the St. Joe flexometer. If the amplitude is constant and the force varies, heat build-up increases with modulus. These conditions are obtainable on the St. Joe and Firestone flexometers. If the force and the amplitude are both constant, the heat build-up is proportioned to the hysteresis, irrespective of modulus. These conditions are approximated with the Goodrich flexometer.

Q. Discuss flex resistance testing of SBR polymers (hot, cold, various oil-extended types, black masterbatches). What correlation with flex testing exists between the normal physical tests conducted on the EPC black vulcanizates established in the former Government Synthetic Rubber Program.

A. It is assumed that flex crack resistance is referred to and not a flexometer test. In the laboratory, on such machines as the DeMattia and Du Pont flexing machines, uncut samples of conventional SBR tread-type stocks have exceptional resistance to cracking. SBR is extremely resistant to crack inception; however, if the samples are precut, the cut grows very rapidly. SBR has poor resistance to cut growth.

This resistance to cut growth depends on many factors; one of the most important is the state of cure which is influenced by the normal physical test referred to. A faster curing polymer would be expected to have poorer cut growth resistance than a slower curing one; this situation, however, could be equalized by accelerator and sulfur modification or a change in the curing time or temperature. Cut growth is also influenced by black dispersion which, in turn, could depend upon raw polymer viscosity.

"Road Testing of Tires," Norman C. Penfold.

Tire testing is probably as old as tires themselves, and while indoor or laboratory testing has become very extensive, there is still a great deal of road testing, which latter involves an expenditure of some five or six million dollars this year. Road testing of tires has become a highly specialized operation in which much emphasis is placed on testing techniques of sound design and incorporating statistical analytical patterns. Road testing is usually the last test a tire must pass for final judgment on its quality or acceptability. Testing does not end at this point, but the major decisions may be made. The interpretation of test results is subject to a great deal of judgment, and it is apparent that experience has been our best teacher, since only by having a considerable background in tire testing can many of the factors be recognized and their importance judged, it was said.

Some of the test variables are: tire size, (loading and inflation pressure); vehicle selected, (wheel and rim size); speed; course, (high speed, low wear), (high wear, moderately curved), (severely abrasive, severe turns), (gravel), (very high speed); rotation pattern; precuts; and aging or conditioning. The reasons for doing some of the things as they are done during testing are again often determined by experience and cannot be explained easily.

There are also many measurements made at the time of the test. While some of the obvious such as tread depth, section width, durometer, and weight come to mind, there are also others such as thumping, noise, and instability which must be evaluated for a complete test. Tread and internal tire temperatures and tire pressures when hot, along with condition before and after are some of the other tests often taken for complete analysis.

As part of a study into tread wear, where it was desired to set up an abrasive index for the surfaces of the test track so that some correlation could be made, the factors which could affect tread wear were listed. This list contains six major headings: speed, load, inflation pressure, mechanical, driver habits, and road conditions, and under these six headings the individual listings turned out more than 40 different conditions to affect tread wear. To evaluate all these conditions and to set up a test and interpret the results for each is the problem involved in road testing. The use of test tracks rather than public roads is growing so that at least some of the variables can be brought under fair control. With the variations due to the driver and the automobile along with difficulty in obtaining satisfactory control tires being present to make duplicity of results difficult, every step toward circumstances conducive to better engineering control, such as the use of properly designed test tracks, has been found to be highly desirable.

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[3] A study of the effects of hysteresis and methods for its measurement in rubber-like materials was made at the request of the Polymer Research Branch of the Rubber Director's Office in connection with the wartime cooperative research program. These results were reported by Dillon and Gehman in RUBBER WORLD, Oct., 1946, p. 61, and Nov., 1946, p. 217; and in *Rubber Chemistry & Technology*, 20, 827 (July, 1947).

Q. How valid are the results from half and well constructed tires in comparison with whole tires? What are the bad features of the half and half construction? What is the meaning of different tread radii in the same tire in half and half construction?

A. We have had mixed experience with two-part tires, but feel that our unsatisfactory experiences have been due to faulty construction; we feel that the results are quite valid if the tire is properly built. Usual problems are concentricity, or otherwise out-of-true shape, poor splices, and non-uniform rolling deflection. We have experienced different tread radii both with the tire as received and as developed during the test. We would prefer to leave the accountability for this to people more familiar with construction or the quite dissimilar character of the tread compounds.

Bruce Habeck, Goodyear, has reminded me that an additional disadvantage of two-part tires is that if one part of the tire fails, the tire can no longer be run so that there is no opportunity to obtain additional mileage to learn how much better the unfailed portion might be.

Q. What wheel position is the most critical toward roadwear? Why?

A. The answer to this is rather complex because type of road, speed, weight distribution, and other factors are quite important. At low speeds and on a flat (uncrowned) road, wear in all positions is almost identical. At extremely high speeds and on flat and straight roads the rear tires wear considerably faster.

At our normal test speed of 60 mph., we usually find that the left front tire wears the least, and the right rear the most. Driving on high crowned roads, on gravel, or doing a lot of cornering may change this order. At high speeds the main difference (assuming equal wheel loading) is usually attributed to wheel torque. At 60 mph. the force each rear wheel exerts at the road surface is about 125 pounds, but at high speeds it can be several times this value and obviously becomes more important as the speed increases since the force varies approximately as the square of the speed.

The spring suspension is important because it may be that the test speed selected is one at which there is a critical vibration problem in the front suspension which will materially increase the rate of wear on either or both of the front wheels.

Q. For evaluation is it better to test two control tires against two experimental tires in a particular group rather than one control and three different types of experimental tires?

A. We usually find that one control and three experimental tires form a good test pattern, but obviously a single test of any item is not nearly so valid as one having more samples. It depends, too, on whether small or large differences are anticipated and on whether the program is exploratory or is a final test. It depends, too, on whether the data fit into a testing program involving a number of materials with small changes, or whether it is a somewhat isolated test; if it is a part of a whole family better judgment can be used in determining whether the test should be accepted as valid.

Q. For workable results what is the least number of groups that should be tested in a particular project?

A. The same general reasoning applying to the previous question may be used here. Obviously the more the better, but certainly compromises must be made in terms of importance of the data, expense involved, and general experience with the type of test employed.

Q. For measuring tread wear only is there a good indoor test?

A. We know of no indoor test which correlates with tread wear data obtained in road testing.

Q. Would it be better to run more groups (six or more) at lower mileage than less groups (three or four) at higher mileage?

A. We assume that by shorter distances you are referring to not less than 10,000 miles and by longer distances you mean perhaps 15,000 to 20,000 miles. On that basis, we would prefer to run more groups and somewhat shorter distances than fewer groups and larger distances, although this policy depends a good deal on the objectives of the test. Perhaps a combination of the two is a good compromise because for demonstration of many features of tire performance we have found there is no substitute for extended driving. The types of failures, experience, and the differences demonstrated will determine how many and how far. If tires behaved in a completely uniform fashion, it would be much easier to answer this question.

Tlargi Xmas Fete

The annual Los Angeles Rubber Group, Inc., Christmas party was held December 12 at the Beverley Hilton Hotel, Los Angeles, Calif. The largest attendance in the history of Tlargi, 698 members and guests, attended this affair. The show was good; the food and service were excellent, and the orchestra did a wonderful job.

Announcement of the election of officers and directors for 1959 was made, and these men were introduced to the guests and members present. The new officers and directors are: chairman, Charles H. Kuhn, Master Processing Corp.; associate chairman, B. R. Snyder, R. T. Vanderbilt Co.; vice chairman, W. M. Anderson, Gross Mfg. Co.; secretary, C. M. Churchill, Naugatuck Chemical Division, United States Rubber Co.; treasurer, Howard Fisher, W. J. Voit Rubber Corp.; assistant secretary, Joe Stetina, Triangle Tool & Machine Co.; and assistant treasurer, L. W. Chaffee, Ohio Rubber Co. Directors for 1959 are: A. H. Federico, C. P. Hall Co.; W J. Haney, Kirkhill Rubber Co.; A. J. Hawkins, Jr., E. I. du Pont de Nemours & Co., Inc.; A. P. Marone, Witco Chemical Co.; J. L. Ryan, Shell Chemical Corp.; R. O. White, Caram Mfg. Co.; and C. E. Huxley, Enjay Co.

Detroit Xmas Party

Some 650 members and guests made the annual Christmas party the high point of the Detroit Rubber & Plastics Group's 1958 meetings. This program, at the Statler Hilton, Detroit, Mich., on December 5 attracted rubber industry representatives from most of the eastern half of the country as SAE-ASTM Technical Committee on Automotive Rubber sessions were scheduled to coincide with the Detroit Group's annual affair.

Highlights for the evening included top-notch entertainment, drawings for more than $1,500 worth of door prizes, and announcement of the 1959 slate of officers. As in past years, the large number of prizes was made possible by the generosity of rubber industry supplier companies.

Special guest of the evening was E. J. Kvet, retired Baldwin Rubber executive and one of the founders of the Detroit Rubber & Plastics Group, who was introduced by his son, E. J. Kvet, Jr., 1958 chairman of the Group.

The 1959 slate of officers is as follows: W. F. Miller, chairman, Yale Rubber Mfg. Co.; W. D. Wilson, vice chairman, R. T. Vanderbilt Co.; S. M. Sidwell, secretary, Chrysler Corp.; E. I. Bosworth, assistant secretary, Columbian Carbon Co.; P. V. Millard, treasurer, Automotive Rubber Co.; and J. M. Clark, assistant treasurer, Utica Bend Corp.

New Monsanto Research

Monsanto Chemical Co., St. Louis, Mo., has signed a contract with the Navy's Bureau of Ordnance to conduct a research program on propellants. The research will be conducted by the special projects department of the company's research and engineering division located at Everett, Mass. The details of the program are classified, but it will apply to propellants, a discovery made in another area of the company's research activities. Also, the department is doing research in other fields, including jet fuels, lubricants, and plastics.

Rubber Division, ACS, Los Angeles Meeting Papers Solicited; Two Symposia Planned

The Division of Rubber Chemistry, American Chemical Society, will hold its spring meeting separate from the parent Society in Los Angeles, Calif., May 13-15, at the Biltmore Hotel. The first technical session will start at 2:00 p. m. on May 13, with Chairman Emil H. Krismann, E. I. du Pont de Nemours & Co., Inc., presiding. This session will be preceded by a regular meeting of the Division's 25-Year Club, with E. G. Partridge, University of Southern California, presiding.

Two symposia will highlight the Los Angeles meeting, which will feature four technical sessions. Included will be two sessions for general or contributed papers, and abstracts for these papers are being solicited by the Division, with the deadline for abstracts being March 19, 1959. Seven copies of 200-word abstracts of these papers should be submitted to the Division secretary, R. H. Gerke, United States Rubber Co. Research Center, Wayne, N. J., before the above date.

The executive committee will meet at Los Angeles to select the recipient of the 1959 Charles Goodyear Medal.[1]

The committee is tentatively planning plant trips for Thursday afternoon, May 14, with the final decision to be made after the number of papers being presented is known and whether or not the number of papers will allow time for the trips as well. If held, the trips will probably be to the DC-8 jet airliner plant of Douglas Aircraft Co. and to an SBR producing plant.

The banquet will be held at the Beverly Hilton Hotel and will be preceded by a "Champagne Ride" from the convention headquarters, Hotel Biltmore, to Beverly Hills. This will be a combination sightseeing tour and cocktail hour. Ladies' entertainment will be typical of California, with a trip to Disneyland on the agenda.

For those who might be combining a vacation trip with the meeting there is a scheduled trip to the Hawaiian Islands following the meeting. The trip will be made by chartered airplane and may be had in either a budget or deluxe version.

The papers to be presented at the two symposia are listed below. Abstracts of those contributed for the general sessions as well as for the two symposia will be published later when they are available.

Symposium on Urethane Foams and Elastomers
Moderator—G. T. Gmitter
General Tire & Rubber Co.

INVITED PAPERS

1. Urethane Polyether Prepolymers and Foams—Influence of Chemical and Physical Variables on Reaction Behavior, by G. H. Scholten, J. G. Schulmann, and R. E. Tenhoor, Dow Chemical Co.

2. Organo-Tin Compounds as Catalysts for Reaction of Isocyanates with Active Hydrogen Compounds, by F. Hostettler and E. F. Cox, Union Carbide Chemical Co.

3. Some Properties and Applications of Loaded Flexible Urethane Foams, by S. J. Assony and S. Chess, Freedlander Research & Development Laboratory, American Latex Products Corp.

4. Rigid Urethane Elastomer Vulcanizates, by R. J. Athey, Du Pont.

5. The Development of Cast Urethane Elastomers for Ultimate Properties, by K. A. Piggot, B. F. Frye, K. R. Allen, S. Steingiser, W. C. Darr, J. H. Saunders, and E. E. Hardy, Mobay Chemical Co.

6. Mechanism of the Water Reaction with Isocyanates, by G. Shkapenko, G. T. Gmitter, and E. E. Gruber, central research laboratories, General Tire & Rubber Co.

Symposium on Effect of Ozone on Rubber
Moderator—H. A. Winkelmann
Dryden Rubber Division, Sheller Mfg. Corp.

INVITED PAPERS

1. Operation of Ozone Chambers in Rubber Laboratories to Minimize Variation in Test Results, by Maurice Lowman, Goodyear Tire & Rubber Co.

2. Ozone Resistance of Rubber Insulations, by W. H. Couch, G. H. Hunt, and O. S. Pratt, Simplex Wire & Cable Co.

3. Weather Aging of Elastomers on Military Vehicles, by E. J. Kvet, J. A. Krimian, Jr., and R. H. Heinrich, Ordnance Tank Automotive Command, Detroit Arsenal.

4. Chemical Inhibition of Ozone Degradation of SBR, by H. W. Kilbourne, G. R. Wilder, J. E. Kanverth, and J. O. Harris, Monsanto Chemical Co.

5. Ozone Cracking in the Los Angeles Area, J. W. Haagen-Smit, consultant, San Gabriel, Calif.

6. Factors Influencing the Ozone Resistance of Neoprene Vulcanizates, Under Flexure, R. M. Murray, Du Pont.

CONTRIBUTED PAPERS

7. Comparative Performance of Antiozonants in Road and Accelerated Tests in the Los Angeles Area, Frank B. Smith, Naugatuck Chemical Division, U. S. Rubber.

8. Wingstay 100 as an Antiozonant, by J. C. Ambelang and B. W. Habeck, Goodyear.

9. Correlation of Ozone Chamber and Outdoor Exposure, by H. A. Winkelmann.

10. Accelerated Aging Tests and Outdoor Performance of Butyl Rubber, D. R. Hammell and W. W. Gleason, Enjay Laboratories.

11. The Ozone Resistance of Styrene-Butadiene Rubber at Low Temperature, R. F. Grossman and A. C. Bluestein, Anaconda Wire & Cable Co.

[1] For details of nomination procedure, see RUBBER WORLD, Jan., 1956, p. 533.

SAE-ASTM Tech A Committee December Meeting

The SAE-ASTM Technical Committee on Automotive Rubber met in Detroit, Mich., December 4 and 5, with the following business conducted.

The revision of the tables in ASTM D 735 met with some resistance in the adoption of tear resistance values in the R tables. Some negative votes questioning the reliability of the tear test could not be resolved. Since, however, quite a large amount of tear test data has been prepared by this subsection, the committee voted to include these data for various ranges of tensile strength on the back of the fly-leaf or "key" in ASTM D 735 and SAE 10 R. These values will relate to suffix G for natural rubber and SBR.

SPONGE. The work of two committees of the Society of the Plastics Industry on sponge was reported to the group. The SPI committee on urethane foam has values covering indentation, compression set, and a steam autoclave test. Copies of these data were distributed, but it was agreed that the range of values possible for flexible urethane foam beyond the range shown in these tables might require a separate table. The other SPI report covered a resilience test being considered, based upon the rebound of a dropping ball. The closed cell PVC specification introduced earlier in 1958[1] has aroused little interest in members present, but is being considered by ASTM.

SPECIFICATION FORMAT. The new specification will use as its basic type characterization for all elastomers a heat resistance test (hot air aging); the basic class characterization will be determined by swelling in ASTM No. 3 oil at 302° F. Values for this swell test

[1] RUBBER WORLD, 138, 749 (1958).

will be: natural rubber, SBR, and butyl (IIR), no specification; neoprene, plus 35 to 75%; Hypalon, plus 76 to 150%; nitrile (NBR), plus 16 to 25%; polysulfide rubber, plus 7 to 15%; polyacrylates, plus 16 to 35%; silicone rubber, plus 35 to 75%; and Viton, 0 to plus 6%. Plans also call for both higher and lower quality grades through the use of sub-classes.

COMPRESSION SET. Some negative votes on the desirability of reducing the conditioning time from 70 to 22 hours for both basic and suffix B compression set requirements for classes SB and SC elastomer compounds were resolved.[2] Another letter ballot will be circulated on the broad question of the correlation of these two conditioning periods to actual service in compression. This discussion led to a recommendation that the subcommittee also study the problem of developing a method for measuring stress relaxation.

SILICONE ELASTOMERS. The revision of Table V of D 735 on silicone rubbers was distributed and covered 13 grades of compounds in hardnesses of 50, 60, 70, and 80 Shore A durometer. Following the receipt of compound data from General Electric, Dow Corning, and Union Carbide for six of these grades a round-robin test will be conducted. Heat aging tests will be run at 450° F., and the compression set will be measured after 22 hours at 347° F. and 70 hours at 302° F.

FLUORO ELASTOMERS. This subsection is continuing work[1] following the favorable response of the first questionnaire on setting up tables for the fluorocarbons. The subsection has agreed to send out another questionnaire for data on compounds and methods of test for: Silastic LS 53, Kel-F Elastomer, Fluororubber 1F4, and Viton. These data will form the basis for the tentative table.

REVISING SAE TABLES. Values of various SAE tables are to be reviewed with the idea of bringing them up to date. They will also be examined to bring them in line wherever possible with Military Specification No. 417. A letter from the Ordnance Department Rock Island Arsenal on the question of both 158 and 212°·F. oven aging for class RN and RS compounds was read. The letter acknowledged that this question is up for review, and Rock Island will handle individual requests for waivers until the question is resolved.

IMPACT TESTING. Along with further refinements of drawings shown at the March and June, 1958 meetings of Tech A a new apparatus design for impact testing equipment was proposed by Mast Development Co. This design appeared to be more complete in detail, and the committee expressed the hope that Mast would proceed with plans to commercialize the unit. It was agreed, however, to continue thought on the other designs so that the final machine would be a simple, foolproof, and low-cost unit.

DIPPED GOODS. Both Ford and Chrysler will make production parts from a tentative specification presented on a natural rubber latex compound as well as from the proposed neoprene latex compound to determine the practicability of these proposed specifications.

² *Ibid.*, 139, 560 (1959).

Ontario RG Talk on Tailor-Made Rubbers

The November meeting of the Ontario Rubber Group was held at the Kress Mineral Springs Hotel, Preston, Ont., Canada. The meeting started with a social hour at which Polymer Corp., Ltd., Sarnia, Ont., was host. This was followed by a dinner with the speaker, H. Laverne Williams, also supplied by Polymer Corp. Dr. Williams discussed "Tailor-Made Rubbers."

Dr. Williams explained that the first synthetic rubbers used an emulsion system simulating natural latex, and by the time World War II came along most of the major advances in emulsion technique had been made. These include use of emulsifiers, shortstops, antioxidants, and chain transfer agents. A limited amount of control was realized with the advent of the cold process to make more linear and regular polymers, but these still fell short of the regularity of natural rubber.

Cationic systems may be used to produce regular polymers. Polyisobutylene is made quite regular, and the polymerization of propylene oxide with ferric chloride and of vinyl isobutyl with boron trifluoride produces polymers with true regularity.

Anionic catalysts such as sodium and potassium yield polymers of irregular structure, but lithium metal or lithium alkyls can be used under proper conditions to produce *cis*-polyisoprene, synthetic natural rubber, such as Coral.[1] A polybutadiene rich in *cis* configuration can also be prepared by this method.

The first heterogeneous catalyst which seemed to direct the propagation step of the polymerization was the Alfin catalyst. This, however, has been displaced by the Ziegler-type catalysts, which have greater versatility and utility. These catalysts have been used to produce linear, high-density polyethylene, linear crystalline propylene, and butene-1 polymers, and the *cis*-poly isoprene polymers such as Ameripol[2] and Natsyn[3] which seem to duplicate natural rubber very closely. A *cis*-polybutadiene has also been prepared which seems to have some beneficial uses in extending natural rubber for very low-temperature and resilience service. More uses may be found if the processability problems can be solved.

The ethylene-propylene copolymers appear to yield a butyl-like rubber which could be used where the best in low-temperature or resilience properties is not required. These polymers are potentially less expensive than butadiene or isoprene polymers, and with the processes apparently economical and suitable it is expected that these polymers will be produced commercially.

"Russia" ORG Topic

The pre-Christmas meeting of the Ontario Group was held December 9 at the Fischer Hotel Grille Room, Hamilton, Ont. More than 100 members and guests attended both the social gathering sponsored by the suppliers before the dinner and the roast turkey banquet.

Head-table guests included M. O. Simpson, Jr., president, Gutta Percha & Rubber, Ltd., who was guest speaker; Carl M. Croakman, Columbian Carbon Canada, Group chairman; D. Seymour, Cabot Carbon of Canada, secretary, ORG; W. R. Smith, Dominion Rubber Co., Ltd., treasurer, ORG; Hugh Way, Gutta Percha & Rubber, Ltd.; Lloyd Lomas, St. Lawrence Chemical Co., entertainment chairman, ORG; Bruce Williams, Feather Industries, Ltd., executive, ORG; Gordon Baxter, Firestone Tire & Rubber Co. Following the dinner several door prizes were drawn, providing the winners with holiday cheer.

John L. MacDonald, Canadian Industries, Ltd., and executive councillor, Division of Rubber Chemistry, CIC, announced that the annual meeting of the Division would be held at the Sheraton-Brock Hotel, Niagara Falls, Ont., May 1, in conjunction with the joint international meeting of the Ontario and Buffalo Rubber groups. Preliminary plans are that the meeting will consist of the presentation of technical papers at the morning and afternoon sessions, to be followed by the traditional social gathering and banquet the same evening.

Mr. Croakman then introduced Mr. Simpson, speaker for the evening. He was one of 30 Canadian businessmen who accepted an invitation to tour Russia last May, and his talk consisted chiefly of descriptive comments about the several hundred excellent color slides he took throughout his

¹Firestone Tire & Rubber Co., Akron, O.
²Goodrich-Gulf Chemicals, Inc., Cleveland, O.
³Goodyear Tire & Rubber Co., Akron.

trip. Covering his stay and tour of Moscow, the slides showed typical buildings, hotels, theaters, apartments for all levels of workers, cathedrals, the Kremlin, together with a good cross-section of everyday city life. The party of Canadians was taken through most industries they had asked to see; toured Leningrad, where the European influence was more noticeable; and were taken to stay at one of the very ornate sanatoria on the seashore in southern Russia where the workers were sent for holidays.

The speaker's comments on the comparison of wages, working and living conditions, both in the urban and rural areas, and the description of their audience with Mr. Kruschev and other Soviet leaders in the Kremlin, together with the possibilities of future relations between the Soviet-controlled bloc and the Western nations, were the most interesting highlights of a very enjoyable and informal description of the trip.

D. Seymour, secretary of the Group, officially expressed the thanks of all present.

Reclaimed Rubber Panel

The Ontario Group held its first meeting of 1959 at the Pickfair Restaurant, Mimico, Ont., January 13. The meeting was devoted to reclaimed rubber, with the technical session being a panel made up of six members from the Rubber Reclaimers Association, Inc., New York, N. Y., and with the social hour having the Association as host.

Along with the panel members and the Group's officers, those seated at the head table included C. H. Peterson, chairman, education committee, Reclaimers Association; and a special guest of honor, W. A. Trull, who has been actively associated with the rubber industry since 1888. Announcements made at dinner were about the next meeting to be held March 10 at Guelph, Ont., and then the combined meeting of the CIC Rubber Division and the joint meeting of the Ontario and Buffalo Rubber groups at Niagara Falls on May 1.

The panel on reclaimed rubber was moderated by M. K. Parrent, General Tire & Rubber Co. of Canada, Welland, Ont. The first panelist was John M. Ball, Midwest Rubber Reclaiming Co., East St. Louis, Ill., whose topic was "What Is Reclaimed Rubber and How Is It Made?" He was followed by Paul J. Nester, Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn., speaking on "What Types of Reclaimed Rubber Are Available?" Next was Bill Macey, The B. F. Goodrich Co., Akron, O., whose talk was about "How Is Reclaimed Rubber Used in Tires and Other Transportation Items?" The second half of the panel was opened by John E. Brothers, Ohio Rubber Co., Willoughby, O., who discussed "What Are the Merits of Reclaimed Rubber in Molded Goods and Non-Transportation Items?" The fifth member, John E. Misner, Xylos Rubber Co., Akron, covered "What Are Premixes, and How Can They Best Be Used?" The final panel member was G. Croft Huddleston, U. S. Rubber Reclaiming Co., Buffalo, N. Y., who summed up the high points of the discussion, using as a title, "What Are the Major Reasons for Using Reclaimed Rubber?"

At the conclusion of the prepared talks, Mr. Parrent read a list of questions which had been asked of previous panels on this subject before other groups and asked the panel members to give their answers to them. For abstracts of similar talks given previously and most of the questions and answers, see RUBBER WORLD August, 1956, page 730; May, 1957, page 246; and September, 1958, page 892.

Chicago Xmas Party

The annual Christmas party and ladies' night of the Chicago Rubber Group was held December 19 at the Terrace Casino of the Morrison Hotel, Chicago, Ill., with more than 820 members and guests in attendance. After a cocktail hour and a seven-course dinner, a program consisting of outstanding night-club and television acts was staged. The gift of the Group to each of the ladies in attendance was a piece of luggage to complete the three-piece set that had been given at each of the previous two parties.

The committee in charge paid special tribute to the more than 125 rubber manufacturers and raw material suppliers who contributed to the success of the affair.

The committee included: Ted Argue, Roth Rubber Co., chairman; Robert Varick, Fred A. Jensen & Associates, assistant chairman; Al Cobbe, Godfrey L. Cabot, Inc.; Doug Moore, Dow-Corning Corp.; Fred Klepetar, Dutch Brand division of Johns-Manville Co.; Angelo Gabriel, Brummer Seal Co.; Grant Sweet, Williams-Bowman Rubber Co., and Jerry Zwick, Goodyear Chemical division, Goodyear Tire & Rubber Co.

Mervin J. Kelly Award By Bell Labs and AIEE

Bell Telephone Laboratories, New York, N. Y., and the American Institute of Electrical Engineers have announced the establishment of an award for achievement in the field of telecommunications, to be known as the Mervin J. Kelly Award.

The award is named in honor of Dr. Kelly, formerly president and now chairman of the board of Bell Laboratories, who will retire on March 1, 1959, after 41 years with the Bell Telephone System. Dr. Kelly is a Fellow of the American Institute of Electrical Engineers and internationally recognized as one of the leading scientists and research administrators.

The Kelly Award will be made annually by AIEE to an individual who has made an outstanding contribution to the advancement of the art of telecommunications. The prize will consist of a bronze medal, a cash stipend of $1,000, and a certificate. The first award will be made in 1960. The award is sponsored by Bell Laboratories, but will be administered solely by the American Institute of Electrical Engineers.

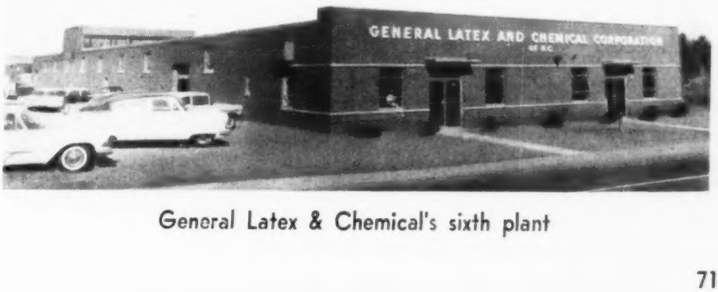
General Latex in N. C.

General Latex & Chemical Corp., Cambridge, Mass., has opened its sixth large compounding plant, at 2321 N. Davidson St., Charlotte, N. C.

In full operation since November, 1958, the new plant has a fully integrated staff, research and development laboratories, and complete facilities for compounding latices for the textile, rubber, automotive, and upholstery industries. In addition, the facility will provide customers in the area with the complete line of General Latex products, including Harrisons & Crosfield Malayan latex and Goodyear Pliolite latices.

Key personnel includes District Sales Manager Jack Hobbs; Sales Representative Ernest Horton; and Chief Control Chemist Everett Eldridge.

The plant covers an area of 25,000 square feet. Ample parking space is provided.



General Latex & Chemical's sixth plant

Meetings and Reports

Connecticut RG Hears Racing Tire Paper

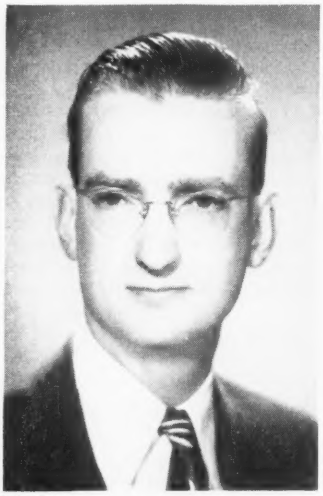
The annual fall meeting of the Connecticut Rubber Group was held in Donat's Town-Ho, Milford, Conn., on November 14, 1958. This was the meeting which honors the pedlers, a regular yearly event in Connecticut, and all salesmen were guests of the Group. After a cocktail hour and dinner the meeting, attended by 146 members and guests, was devoted to racing and racing tires. The speaker was Clark E. Stair, The Firestone Tire & Rubber Co., Akron, O., who spoke on "Four for the Road." This talk was followed by a film taken of the 1958 race at Indianapolis, Ind.

Mr. Stair discussed both the development of racing tires and the benefits derived from information obtained in the use of tires on the race track. Firestone considers that the effective research laboratory the track provides is one major reason for being in the racing tire business. The product recognition is another big reason. In early days of racing, tires often failed quickly. Many manufacturers supplied tires at that time, with even some foreign makes in evidence. Most of these had withdrawn by 1925, and now the winner has ridden on Firestones for 35 consecutive times.

New improvements have been proved at Indianapolis many times. Balloon tires were checked out first there. Many new compounds and cords have had the race provide a test, and the information obtained rides with the modern car on the high-speed turnpikes and throughways.

A racing tire must meet many important criteria. The first and foremost is safety. To get this the design must provide high body strength, stability, maximum traction, cool running, and best possible tread wear. Some features that a racing tire uses to gain some of these advantages are large size, high tire inflation pressure, high cord angle, and the use of stiff compounds. Currently a six-ply nylon tire with high cord angle and relatively stiff compounds is being used in the race. As an example of the extreme abrasion-type wear the tires are subjected to, a Lincoln running the Indianapolis track wore out the right front tire in 30 laps, or 75 miles, when traveling at 90 mph. This datum gives an indication of what can be expected in the 135 mph. plus speeds of the actual race.

Mr. Stair described the development of a tire made specifically for a race on a track at Monza, Italy, which because of a highly banked track allows very high speeds with considerable side thrust and pressure. European tires had failed in only six or eight laps, and it proved to be necessary to design new molds and construction to provide a tire to withstand this service. That a satisfactory tire was produced is borne out by the record of two years. A total of 1,000 miles of racing and speeds up to 175 mph. did not cause any tire failures—an amazing safety record for a race which was once described as mass suicide.



Robert Laws

Drace Kutnewsky, NCRG President

Resins and Bonding Discussed at NCRG

The Northern California Rubber Group started the new year under Drace "Kut" Kutnewsky as president, with two speakers at the January 8 meeting. This meeting was held at the Berkeley Elks Club, Berkeley, Calif., with the technical session following the dinner. A feature of the dinner was the introduction of seven new members.

The Group's new president, Mr. Kutnewsky, Burke Rubber Co., San Jose, Calif., joined Burke in 1952 and is presently serving as technical director. Before his arrival in California, Mr. Kutnewsky was affiliated with the Gates Rubber Co., Denver, Colo. A graduate of New Mexico University, he is married and the father of three daughters.

The technical session consisted of talks by Neal Estrada, Reichold Chemicals, Inc., San Francisco, Calif., who spoke on "Resins and Rubber," and Julius Tervay, Wyandotte Chemicals, Los Angeles, Calif., who discussed "The Use of Specialty Chemical Compounds for Metal Preparation, Bonding, and Mold Cleaning."

Mr. Estrada, in his talk, spoke about the resins which are rubber-like in their uses, particularly those which have been substituted for SBR latex in the paint field. He noted that the polyesters, polyvinylacetate, acrylics, and polyvinyl chloride, accounted for one-fourth of the market this past year and should gain in 1959. The use of PVC and PVA is expected to grow in the outdoor paint use where SBR-base paints have not been satisfactory owing to poor oxidation stability.

Mr. Tervay described some of the newer methods of cleaning molds and preparing metals for bonding. He stated that most metals, both ferrous and nonferrous, can be cleaned with alkali metal phosphates. He also discussed chlorinated or ammonia-base water rinsable solvent cleaners, electrical, and ultrasonic cleaning. Each has several good points to recommend it and several drawbacks.

For metal preparation prior to bonding, Mr. Tervay said that alkaline cleaners plus electrical current are best. He did indicate that the use of Phosporite or Cupridine also gives good results on steel, aluminum, zinc, or galvanized metals and does not require special equipment without corrosion problems.

Design Engineering Show and Conference

The Design Engineering Show, the exposition devoted to research and development, will return to Philadelphia, Pa., where the first show was held in 1956. It is scheduled for Convention Hall, May 25-28, inclusive.

The show has had a phenomenal growth in its first three years and is now one of the largest industrial annual expositions in the country. About 400 companies are expected to exhibit, according to Clapp & Poliak, Inc., producer of the event.

Coinciding with the show, the fourth annual Design Engineering Conference also will be held at Convention Hall. The conference is sponsored by the machine design division of the American Society of Mechanical Engineers.

At the 1958 show held in Chicago, Ill., there were 411 exhibiting companies and more than 18,000 in attendance. Of those attending last year 73% were engineers, and the remaining 27% were from the management of companies.

Exhibits, prepared to aid in the design of new end-products, include mechanical components, power transmission equipment, electrical and electronic components, metals, non-metallic materials, fasteners and adhesives, finishes and coatings, shapes and forms, hydraulic and pneumatic components, and various engineering equipment and services.

Advance registration cards, conference programs, and hotel information may be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

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WASHINGTON REPORT

By JOHN F. KING

Eisenhower Budget Gas-Tax Hike Likely To Have Much Opposition

President Eisenhower's budget for fiscal 1960, delicately poised on a $77-billion balance between estimated revenues and expenditures, springs from a fundamental truth of business life. It is sound business principle, the President says in his budget message, that entities—government and private—strive to live within their means.

As he put it, "By avoiding a deficit, it will help prevent further increases in the cost of living and the hidden and unfair tax that inflation imposes upon personal savings and incomes."

Business and Congress Opposed

If adherence to the principle is satisfying to the business community in general, its application in the new budget is creating a chorus of protests from important business groups, including the rubber industry.

Along with automotive, trucking and transport, oil and farm industry groups, the rubber industry is up in arms about Mr. Eisenhower's proposal to jack up to 4½¢ a gallon the federal tax on fuels to finance the recession-expanded federal highway construction program. Under the banner of the National Highway Users Conference, the rubber industry and its allies served notice long before the budget was made public, January 19, that they would fight the proposal.

The first arena of the fight between the Users Conference and the Administration will be the tax-writing House Ways & Means Committee. Should the Administration win the argument in the House, the next contest will be fought out in the Senate finance committee, whose conservative chairman, Harry F. Byrd (Dem., Va.), is reckoned to be more receptive to the President's "pay-as-we-go" modification in the financing of the Highway Program.

Highway Users Conference Opposition

Indications that the gas tax proposal would have tough sledding in the House and might never see the light of day in the Senate came immediately from House Speaker Sam Rayburn (Dem., Tex.). He said the day after the budget was released that the idea doesn't stand much chance of adoption. The Democratic chief pointed out the states "feel they should have that field of taxation—or what's left of it . . . So I think it will be pretty hard to get a 4½¢ tax" as requested by the President.

Before the legislative battles are joined, however, the Highway Users Conference will organize its campaign to save the auto, oil, rubber, transport, and other protesting industries from being "tapped for more and more taxes." The conference with the full support of its subscribers already has outlined five main arguments to bolster its opposition to the proposed fuel excise increase from its present 3¢ level to 4½¢. They are:

(1) It was the sense of Congress in enacting the 41,000-mile interstate highway building program in 1956 that "everybody pays"—not just the commercial "users," although special "user" taxes enacted then are now paying the full cost.

(2) Inasmuch as the road system is a national defense asset, its cost accounting should be more equitably apportioned—that is, general government revenues should be employed. A second reason general revenues should help meet the expected deficit in the Highway user-tax "trust fund" is that the program was expanded and construction speeded up by the last Congress as an anti-recession measure.

(3) A user tax boost will retard the use of highway vehicles and thereby benefit no one, the government or the user industries.

(4) It would put a serious crimp in state tax revenues.

(5) The Federal Government already is taxing fuel at an "exorbitant" rate. The increase would boost federal levies on gasoline to 9¢, or 41% of the retail cost of one gallon.

RMA's Protest

The Rubber Manufacturers Association, Inc., has its own more elaborate case. Issued six days before Christmas, when the Association got wind of the fact the Administration was planning to ask for a user-tax hike, RMA President Ross R. Ormsby's "vigorous opposition" to the whole idea turned on this argument:

"The tire manufacturers were strong supporters of the Highway Act of 1956, even to the extent of backing a 60% increase in the federal excise tax for highway-type tires deemed necessary to the successful financing of the program.

"They also supported the imposition of a new tax on tread rubber used in retreading highway-type tires. This Act created the Highway Trust Fund, into which all of the tax revenue derived from tires, inner tubes, and tread rubber was earmarked for highway expenditures."

Ormsby pointed out that besides contributing taxes to the Trust Fund—in which rubber products "provide funds for highway construction second only to gasoline"—"users" also pay substantial taxes into the General Fund. He called for appropriation from general funds to finance completion of the superhighway network and to support other federal-aid road programs.

RMA tax experts contend that the Administration's fuel tax proposal is designed to offset a $900-million fiscal 1960 deficit in the Highway Trust Fund which program managers actually had anticipated for some time. The deficit, they argue, stems from the fact Congress expanded the scope of the building program to function as an anti-recession measure, and because there had been built into the 1956 Act a "basic incompatibility" between the tempo of the construction program and its user-based financing features. The "incompatibility" arose out of the fact that Trust Fund income and expenditures could not come into full balance until the program is completed in 1969, this argument goes.

Eisenhower Estimates

In his budget message, Mr. Eisenhower estimated the fiscal 1960 deficit for the Highway Trust Fund at only $241 million. But forecasts of income and spending under the program in fiscal 1961 and 1962—under the present user-tax financing—would raise the three-year deficit between fiscal 1960-62 to a whopping $3.5 billion.

Enactment of the $1\frac{1}{2}$¢ per gallon increase in fuel taxes, however, would put the Trust Fund comfortably in the black between June 30 this year and June 30, 1962, according to the President's formula.

He offered these estimates:

On the basis of the present tax setup, the deficit in fiscal 1960 would be $241 million. By 1961 the red-ink total would rise to $1.1 billion and would rise another $2.2 billion in fiscal 1962. Computed on the assumption the $1\frac{1}{2}$¢ boost goes into effect, the "pay-as-we-go" program would show a Trust Fund surplus of $451 million in fiscal 1960, $410 million in 1961, and $148 million in fiscal 1962.

The forecasts thus assume that the $1\frac{1}{2}$¢ tax-hike will bring in an additional $650 million in the year beginning July 1, another $1.5 billion in fiscal 1961, and $2.3 billion in fiscal 1962. The fund was in strong surplus positions in fiscal years 1957 through 1959.

The President calls his proposal a "temporary increase of $1\frac{1}{2}$¢ in highway fuel taxes, to become effective July 1, 1959, and remain in effect through the fiscal year 1964." The only other new specific tax proposal made by the President in his budget called for a boost—not identified as a "temporary increase" as the highway fuel tax plan—from 2¢ to $4\frac{1}{2}$¢ per gallon in the federal tax on aviation gasoline, and the establishment of a $4\frac{1}{2}$¢ tax on commercial jet aircraft fuel, which is now untaxed. These levies also reflect the user principle, being designed to finance the airways' modernization program.

Coupled with the President's other budget proposals, the highway and aviation fuel tax proposals will go far toward producing budgetary surpluses "which can be used to lessen the burden of taxes, meet the cost of essential new government services, and reduce the public debt."

This rosy promise, however, contained numerous presidential injunctions to the new Congress to go slow with spending programs. Throughout his message the Chief Executive argued that while his $77-billion worth of proposals was realistic, they were attainable only with the responsible cooperation of the Legislative Branch.

Eisenhower Asks $5.5 Billion For Government Research in 1960

Following immediately strengthened defense and foreign affairs programs, President Eisenhower wants the government to increase scientific research and development as "must" achievements within the next 18 months. His fiscal 1960 budget placed third highest priority, out of 11 major program recommendations, on a stepped-up science program.

While the Chief Executive laid the greatest emphasis in his budget message on space exploration, peaceful uses of atomic energy and "basic science," rubber industry scientists and technicians can expect the government to open up wider horizons for their talents. This is because in the coming fiscal year the Federal Government will be spending nearly $5.5 billion for science activities, far more than it ever has in the past.

Defense Department R&D

Excluding an estimated $2 billion in Defense Department procurement funds which actually support research and development projects, the Department will be spending $3.7 billion on R & D in fiscal 1960. This figure compares with an estimated $3.3 billion that Defense will spend by the end of the current fiscal year and only $2.3 billion spent in fiscal 1958.

At the same time the Atomic Energy Commission will spend nearly $850 million in R & D, up $200 million from fiscal 1958. The new National Aeronautics & Space Administration will spend $280 million, compared with only $89 million its predecessor agency spent in fiscal 1958.

NSF Research

The National Science Foundation spending for "pure" science research, which eventually will add to the pool of knowledge for industrial application, will advance from $60 to $80 million between 1959 and 1960. NSF outlays in fiscal 1958 by contrast totaled only $35 million. All other agencies—such as the National Bureau of Standards of the Commerce Department which will boost spending from $5.3 million in 1958 to $15.7 million this fiscal year to $21.7 million in 1960—will combine to push total government-underwritten R & D projects more than $2 billion higher than total outlays of $3.5 billion in fiscal 1958. The estimated total expenditure in this field in fiscal 1959 will be $4.8 billion, or $800 million under the projected $5.5 billion total for fiscal 1960.

One-tenth, or $500 million of the 1960 total outlay, will go for "basic science"—"pure" scientific research—according to the President's message. Apart from NSF programming, most of the basic studies will be carried out by the Defense Department and the new space agency, NASA.

Defense Takes 80%

The President's budget demonstrates that more than 80% of the total anticipated outlay of $5.5 billion is defense work—programs for new and improved weapons systems such as missile complexes, atomic weaponry, etc. The nearly $1 billion balance is split up among the above-named civilian agencies, the Department of Agriculture, the Department of Health, Education & Welfare, and the scientific programs of other Cabinet agencies.

In the aggregate of total American investment in scientific research and development, the Federal Government supplies about half the cash. Private industry finances most of the remainder, and smaller amounts are made available by funds of foundations, educational institutions, and by state and local governments.

NSF and NBS Budget Breakdown

A fuller analysis of the budgets of the National Science Foundation and the National Bureau of Standards, of wide interest among rubber technicians, follows.

While actual spending of NSF will rise only to $80 million in fiscal 1960, President Eisenhower's request for new appropriations totals $160 million, up $24 million from the amount Congress appropriated in the current fiscal year. The increased 1960 appropriation, while not all earmarked to be spent in the same year it is appropriated, would be used for stepped-up basic research projects through fellowships, etc.

As stated in the budget, the increased funds "will provide for support of a greater percentage of meritorious scientific research proposals; for additional facilities for fundamental scientific research; for making the results of research conducted in the U. S. and abroad more readily available within the scientific community; and for the continuation of programs to improve science teaching and to increase the number of highly qualified research scientists in this country." The higher NSF funds also will be used to finance (1) basic research facilities at universities and other non-profit institutions in most scientific fields; (2) collecting, translating, cataloging, and disseminating the results of scientific inquiry here and abroad; and (3) studies of the "status of research" in the U. S. and foreign countries.

(As noted elsewhere, NSF's special rubber research program is to be terminated in fiscal 1959—that is, by June 30—and no new funds currently are programmed for this work.)

While the level of spending by the Bureau of Standards in fiscal 1960 will rise $6 million to a total of $21 million, using funds appropriated in earlier years, NBS's request for new appropriations rises only to $17.5 million. The actual increase in spending, according to the budget, "will permit significant expansion in selected urgent areas of research, allow reorientation

of certain programs . . . and provide for the augmentation of the Bureau's research equipment." Not included in these funds, but itemized in another money bill to be sent to Congress shortly, are pay raises for NBS scientists and engineers, authorized December 29.

Of interest to rubber technicians, NBS plans to use part of its increase in spending to expand its program of determining the properties of organic and fibrous materials under extreme situations. The new money also will finance a new chemistry program to make crystals of very high purity from these organic materials, for the use of interested research institutions.

Federal Expenditures for Stockpile, Plant Upkeep Lower in Fiscal 1960

The gradual disengagement of the Federal Government from certain rubber industry problems that still remain since World War II shows through in the scientific research and general industry support sections of the new budget for fiscal 1960.

Stockpile Costs Down

In line with the government's changed strategic concept of the stockpile of strategic commodities, rubber in the next fiscal year will be costing the taxpayer less money than in fiscal 1959. The budget of the General Services Administration, which runs the stockpile, will provide fewer funds in fiscal 1960 to rotate perishable commodities such as rubber, fibers, and oils.

GSA believes that "substantial progress has been made in improving the condition of (these) materials . . . so that the volume of rotation is expected to decrease" in 1960 from 1959 by $13.4 million. Estimated gross replacement costs under the rotation plan will total $63.8 million in 1959, but will drop to $49.4 million in the year beginning June 30. Receipts from sales through rotation at the same time will drop only from $55.3 to $43.3 million, and the net cost will therefore decline from $8.5 to $6.1 million.

The costs of individual commodities being upgraded under the rotation plan are not prorated in the budget, but it is believed rubber accounts for the lion's share of the total.

GSA December Report

It should be pointed out that in his semi-annual report on the stockpile to Congress in December, Stockpile Chief Leo A. Heogh confirmed the decline in rotation costs. Between January 1 and June 30 of 1958, 10,189 long tons of rubber were rotated, as compared to 23,324 long tons during the previous report period of June 30, 1957, to January 1 last year. Mr. Heogh said the decrease in rubber rotation "resulted primarily from the general decline in consumption and the substantial completion of upgrading the stockpile to the grades now being more commonly used in industry."

Mr. Heogh, incidentally, confirmed for the first time publicly what rubber experts have known since the defense planners reduced the mobilization period from five to three years, thereby producing "excesses" of stockpile commodities: The government not only has more rubber than it needs for a five-year supply emergency, but it has more than it needs for a three-year mobilization. Unofficial, but unchallenged estimates put the strategic stockpile of rubber at 1.2 million long tons.

Synthetic Rubber Plants

Concerning another problem that has long been a costly budget item for the government, the new budget reports less money will be spent on the upkeep of those facilities still not sold to private industry. Meanwhile, the budget goes on, "Disposal efforts will continue" to sell off the Louisville, Ky., alcohol-butadiene plant and the catalyst manufacturing equipment located in Baltimore, Md.

According to spending forecasts, expenses for maintaining these inoperative facilities will decline slightly in 1960, when custodial and related services will cost $1,023,000, compared to $1,051,000 expected to be spent in 1959 and $1,154,000 spent in 1958. The 1960 drop-off reflects continuation of smaller expenses for administration and plant upkeep. Some of the funds will be made up of government income from collections on the principal and interest on the mortgages outstanding on facilities already sold off to the rubber and the oil industry.

A final rubber item in the budget which represents a net savings of federal revenue is spelled out in the National Science Foundation budget. The basic research program involving the physical properties of rubber will be terminated as of June 30 when the $13,000 remaining for the studies is spent. No new money for related investigations is requested for the fiscal year beginning July 1.

Hearings on Business Practices To Continue

The rubber industry will be in the van of business groups fending off a fresh legislative assault to guarantee the rights of smaller businesses in the market place. Scarcely organized since the November election, the heavily Democratic 86th Congress has readied new anti-business measures and has dusted off some old ones for consideration between now and 1960.

Sen. Hubert H. Humphrey (Dem., Minn.) already has set tire marketing hearings for late January or early February for his Small Business Subcommittee, which long has been a sounding board for the complaints of the independent tire dealers. In the current investigation Humphrey will concentrate on nearly a dozen areas of complaint, which boil down criticisms that the tire manufacturers are trying to squeeze the independent retailers out of the market by direct distribution by their own retail outlets.

In the background of the Humphrey probe will be new moves by the Federal Trade Commission to tighten up on illegal trade practices among manufacturers of tire and tube repair materials, such as supplier price discrimination. FTC will stage public hearings on its trade practice code for tire-tube materials manufacturers.

Reopening the larger issue of new business regulation—but one in which the rubber companies have vital interests—will be Sen. Estes Kefauver's tough "Good Faith" bill. This controversial measure, which died in the last Congress, would end a distributor's defense that he cut prices in "good faith" to meet competition, and not through predatory motives designed to eliminate competition. Kefauver's Judiciary Subcommittee will hold early hearings on his new bill.

Backing up the Humphrey-Kefauver attack on the marketing systems of rubber and other industries will be Sen. Joseph C. O'Mahoney (Dem., Wyo.), who is sponsoring another premerger notification bill. Also passed over in the last Congress, the O'Mahoney bill would require advance notification to the government by business organizations planning a merger. The object is to give the government a checkrein on monopolistic combinations before, not after, the fact.

A host of other market-jiggering bills are on tap—some old, some new. There is a general hope among businessmen, however, that the conservative leadership in both House and Senate will tramp down the more radical proposals with little difficulty.

Fritch in BDSA Post

Martin H. Fritch, manager of market development for the tar products division, Koppers Co., Pittsburgh, Pa., has been named administrative adviser to the Chemical & Rubber Division, Business & Defense Services Administration, U. S. Department of Commerce. It is a temporary assignment of at least six months without compensation from the government, a program of the National Defense Executive Reserve.

INDUSTRY NEWS

Highest Sales Predicted By Rubber Industry Leaders for 1959

Year-end reports received from industry leaders after our January issue went to press, and summarized below, continued the optimistic views for 1959 expressed by the RMA and from those industry executives whose statements appeared in January.

H. E. Humphreys Jr., chairman of the United States Rubber Co., expects rubber industry sales in 1959 to set a new record of more than \$6 billion, compared with an estimated \$5.5 billion in 1958. He cited four principal reasons for his optimism: (1) The industry faces a rising economy in 1959, a sharp contrast to the recession faced in 1958. (2) The market for replacement tires is growing. (3) There is a revival in demand from automotive manufacturers for industrial rubber products. (4) The markets are expanding for the industry's chemicals, plastics, and other non-rubber products.

In order to keep pace with this growing volume of business, U. S. Rubber, he said, plans capital expenditures of approximately \$30 million in 1959, compared with \$25 million in 1958.

Passenger-car, truck, and bus tire sales were estimated at 103 million units in 1959, against an estimated 94 million in 1958, of which 90 million would be passenger-car tires in 1959, as compared with 82 million in 1958. Truck and bus tire sales in 1959 should amount to 13 million units, in contrast to the 12 million sold in 1958. Of these 90 million passenger-car tire sales, replacement sales should set a new record of about 61 million units, compared with 59.5 million in 1958, and original-equipment tire sales will depend upon new car production this year, which Mr. Humphreys thinks will amount to more than five million units.

The automotive industry buys approximately 12% of the rubber industry's output, and renewed automotive demand will boost sales not only of tires, but of the many other rubber products which go into new cars.

Sales of industrial rubber products follow closely the Federal Reserve Board index of industrial production and capital expenditures of all industry. With increases forecast in both of these categories, the rubber industry can look forward to improved sales of conveyor belts, hose, packing, power transmission belting, and other industrial rubber products, it was said.

With new rubber consumption in this country estimated at 1.5 million long tons in 1959, 65% of which will be synthetic rubber, the consumption of more than 500,000 tons of synthetic rubber abroad in 1959 was also mentioned. Much of this foreign increase in synthetic rubber consumption is due to expanding foreign synthetic rubber consumption capacity, however, with Italian, English, and German plants in operation late in 1958, and French and Japanese plants scheduled to start production in 1959.

Mr. Humphreys emphasized that a promising area for future growth lies in the field of plastics where U. S. Rubber is both a manufacturer of raw materials and a fabricator of plastics products. About 20% of the company's planned expenditure of \$120 million for research and development during the next five years is to be devoted to plastic raw materials and products.

Harvey S. Firestone, Jr., chairman of The Firestone Tire & Rubber Co., predicted that 1959 should be the best sales year in the history of the rubber industry. He based his optimistic forecast on the continued growth of unit tire sales, increased sales of all other divisions in the rubber industry, and the encouraging rate of expansion of foreign operations.

Passenger-car production in 1959 is estimated at 5.5 million units, a rise of 1,250,000 from 1958 output, and truck production will rise some 220,000 units, Mr. Firestone forecast.

The market for replacement-tire sales through local tire dealers on some 43 million cars that are now two years old or older presents another outstanding opportunity for 1959.

As for foreign operations, the rate of growth is exceeding that at home. Rubber consumption outside the United States increased 94% in the past 10 years, as compared with our increase of 42% in the same period.

It is therefore reasonable to expect that 1959 will be the best sales year in the history of the rubber industry, Mr. Firestone said again.

E. J. Thomas, chairman of The Goodyear Tire & Rubber Co., stated also that forecasts indicate that the rubber industry in 1959 will have the highest dollar volume of sales in its history. Goodyear plans a capital expenditure of \$70 million in 1959, \$10 million more than was spent in 1958.

Thomas said this increased planned expenditure is evidence of Goodyear's faith in the sound recovery of business in 1959; he believes automobile, truck, and tractor manufacturers will need 25 to 30% more tires and other rubber products in 1959.

Goodyear has recalled 60% of its laid-off workers, and working hours per week are now back to full five and six days. Industry inventories of raw materials and finished goods have reached their low point and are now on the rise. No big rise in prices for rubber products is anticipated in 1959.

Thomas predicted replacement passenger-car tire sales of 62 million units in 1959, an increase of nearly two million units over 1958 sales. For the industry as a whole, 1959 pneumatic tire production (including industrial pneumatics) is estimated at 112 million units *versus* 102 million units for 1958.

William O'Neil, president of The General Tire & Rubber Co., said he was confident that 1959 will be a good year for General Tire, the rubber industry, and the nation. He estimated pneumatic tire production at 111 million units in 1959, but said this figure could be on the conservative side.

General Tire plans to meet the growing demand by the construction in 1959 of a third, multi-million-dollar tire building plant.

General Tire foresees an equally promising future for the company's sizable investments in such other basic industries as the missile field, chemicals, plastics, wrought iron and steel, and the entertainment field through radio and television.

For years a major factor in most of the nation's principal rocket, satellite, and rocket propulsion programs, Aerojet-General today is also a leader in such challenging fields as nucleonics, nuclear energy, infrared guidance, marine and architect-engineering.

Both General Tire's chemical and plastics divisions forecast rising demands in 1959. The automotive, aircraft, and furniture businesses will make greater use of plastics materials this year, O'Neil declared.

In summary, General Tire's president said the overall outlook is bright. All facets of the nation's economy have turned upward . . . and there is every reason to predict gains for all of the basic industries. For the companies that have planned well, the year 1959 will be a good one.

R. L. Miller

Conway Studios

R. G. Seaman

B. B. Wilson

New General Manager and Ad Manager for RW

Robert G. Seaman has been made general manager and Robert L. Miller advertising sales manager of RUBBER WORLD. B. B. Wilson retains the title of publisher and will continue to act as a management consultant to the publication for which he became business manager in 1932. As vice president and a director of Bill Brothers Publishing Corp., he will now devote more of his time to the general management areas of activity.

Bob Seaman joined RW in 1942 as technical editor and became editor in 1945. He has been responsible for the continuous improvement in editorial quality and appearance of the magazine and in 1946, recognizing the growing importance of plastics to the rubber industry instituted a Plastics Technology department in RW. *Plastics Technology* became a separate publication in 1954.

The new general manager and editor received his B.Chem. degree from Cornell University in 1925. Prior to joining RW he was employed as a development and then production control chemist for United States Rubber Co. He has been very active in the affairs of the rubber divisions and committees of the American Chemical Society, the American Society for Testing Materials, and the American Society of Mechanical Engineers, of which latter organization he is past chairman of the Rubber & Plastics Division. He is also a member of the administrative committee and secretary of the program committee for the 1959 International Rubber Technology Conference which is to be held in Washington, D. C., this coming November.

Bob Miller attended West Virginia University and West Virginia Institute of Technology and receved his B.S. from the latter in 1942. He majored in business administration. After several years in selling and banking he joined the advertising sales department of RW in 1957 and was made eastern sales manager in 1958. He is now responsible for all advertising sales activities.

World's Largest Private Nuclear Reactor Owned by Ten Companies Begins Operation

The world's largest nuclear research reactor entirely owned and operated by private industry went into operation on January 21 at Plainsboro, N. J., near Princeton. The facility is the five-million-watt research reactor of Industrial Reactor Laboratories, Inc., owned by ten of the nation's leading industrial companies, including United States Rubber Co. The other IRL participants are American Machine & Foundry Co.; American Tobacco Co.; Atlas Powder Co.; Continental Can Co.; Corning Glass Works; National Distillers & Chemical Corp.; National Lead Co.; Radio Corp. of America; and Socony Mobil Oil Co.

The reactor consists of a special concrete pool rising 30 feet from ground level within a large, aluminum-sheathed concrete "beehive" dome. (See cover illustration.) There is also a laboratory and administration building connected to the north side of the "beehive," which houses a "hot" laboratory area for handling radioactive materials; individual research laboratories for the participants; and administrative offices, health facilities, a reception area, and miscellaneous service facilities.

Harry L. Hilyard, president of IRL, stated at the start of the operation that this major nuclear research center inaugurates a new era in industrial research and represents a major contribution by private enterprise to President Eisenhower's "Atoms for Peace" program. The nuclear reactor, as a most powerful tool of modern research, holds both challenge and opportunity for industry, he added.

It was also pointed out that the joint reactor project of IRL sets a pattern which all of industry may ultimately follow in order to make use of the most advanced scientific techniques. In this cooperative effort, perhaps the largest yet attempted by industry in the field of research, ten non-competing enterprises operating in diverse fields will have at their disposal a complete, large nuclear research facility at a fraction of what it would cost in terms of money, time, and personnel on a single-company basis.

Among the statements made by individuals of the participating compaies was one by Wallace E. Cake, vice president in charge of research and development, U. S. Rubber. Dr. Cake explained that participation in the atomic energy project at Plainsboro gives U. S. Rubber an excellent opportunity to develop and expand work in atomic energy as it relates to the fields of rubber, plastics, textiles, and chemicals.

"First, atomic energy research can help us design industrial rubber products such as gaskets, packings, rubber tank linings and fabrics which will withstand the effects of atomic radiation," he added.

"Second, we believe that we can make better rubber and plastics products if we subject them to atomic radiation during manufacture. For example, we can make a golf ball with a tough, longwearing cover by subjecting the cover

to rays from radioactive materials.

"Third, atomic radiation will permit us to join many materials chemically for the first time to form new plastic and rubber-like materials. Through the use of atomic radiation, we have already been able to reinforce polyethylene with carbon black much the same as we now reinforce rubber with carbon black. The result has been a tougher polyethylene and one that has greatly improved resistance to high temperatures.

"Through atomic radiation, we can also make rubber and many plastics reactive so that we can produce new and useful 'graft polymers,' entirely new families of plastics and rubber-like materials.

"Research at this nuclear reactor will assist us to determine the feasibility of a reactor designed to produce both radiation for these processes and steam for heat and power.

"We expect to produce radioactive isotopes by exposing various elements to the neutrons from the reactor. By these studies we hope to find new uses for these radioactive materials.

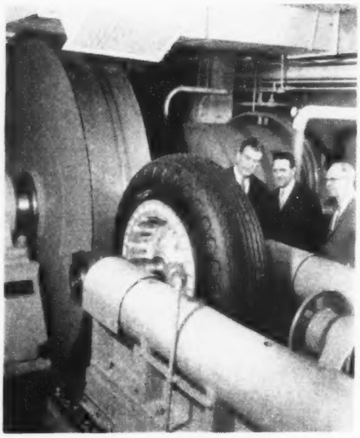
"Finally, products of atomic energy studies can improve production processes and are proving useful in our research studies. Presently we use radioactive strontium as a means of controlling the gage, or thickness of certain materials. We also use radioactive tracers to study the effects of agricultural chemicals on plant systems. These studies have enabled us to make more useful agricultural chemicals."

Vinylfoam in Cushions

Molded Vinylfoam, a new and versatile foam cushioning material, will be offered in various groups in the 1959 line of International Furniture Co., it was recently announced by International and by Union Carbide Plastics Co., developer of the material and a a division of Union Carbide Corp., New York, N. Y.

The decision to use Vinylfoam in its 1959 line, reported International, was influenced by cost, the fact that it is fire-resistant, and because of its durability and longer service life. Its use as a cushioning material in many public conveyances has demonstrated that customers have enjoyed its soft but not bouncy feel. The durability of Vinylfoam has been demonstrated by its use in a number of applications, ranging from theater seating to jump seats in New York's and Chicago's taxicabs and molded cushioning for the seats in New York's subway system.

The material's resistance to oxidation and hardening keeps it resilient indefinitely, and its non-discoloring properties assure that it will always remain attractive, reports Union Carbide. The fact that it will not support flame itself, and is self-extinguishing

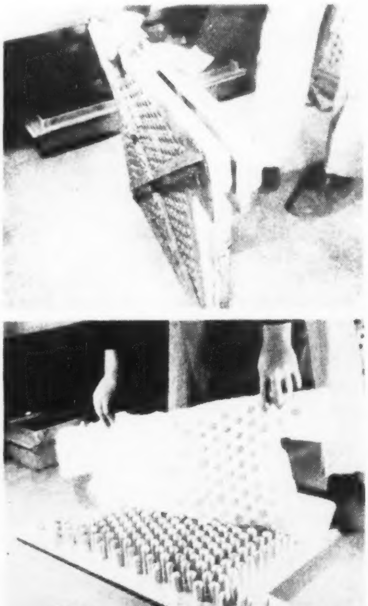


Firestone's new jet-tire dynamometer

as soon as the source of flame is removed, is an important attribute so far as the furniture trade is concerned. The significance of this factor in the home, factory, warehouse, and store will be an important sales feature of the new International line.

Other service applications for vinyl foam products include such uses as automobile arm rests, seating for schools, cushions for post office stools and other public buildings, and the first padded automobile sun visors used by Ford Motor Co.

A brochure describing the features and the production of vinyl foam is available from Union Carbide Plastics Co.



Separating two-piece mold *(top)* to release the cured, fully cored, untrimmed vinyl cushion *(bottom)*

New Dynamometer Tests Firestone Jet Tires

The Firestone Tire & Rubber Co., Akron, O., has installed what is said to be the fastest dynamometer in operation in its tire testing laboratory. The dynamometer, or Big Wheel, is ten feet in diameter, weighs nine tons, and has been checked out at 311 miles an hour. The apparatus, of which the Big Wheel is the outstanding feature, produces the conditions which simulate take-off and landing of a B-52-G jet bomber.

The B-52-G weighs 200 tons fully loaded and to become airborne must reach the speed of nearly 250 miles an hour. This condition can be simulated on the Big Wheel by increasing the revolutions of the wheel against the test tire until take-off speed has been duplicated. A landing condition is simulated by revolving the wheel at the airplane's landing speed and forcing the test tire against it.

The Big Wheel is driven by an electric motor which can deliver as much as 4,500 hp. The motor can revolve the wheel from a standstill to 840 rpm (300 mph.) in about 20 seconds under load. A load up to 60,000 pounds can be applied to the tire by an air cylinder.

This dynamometer can be automatically programmed. Its actions can be set up and controlled by feeding into it instructions on paper graphs which are then fed to an electronic computer, which in turn enables the machine to simulate countless different runway lengths, landing and take-off speeds, and the weight of planes.

The dynamometer automatically makes a record of what it is doing. This record can be checked against the original printed instructions to see that they have been completely carried out. Also, automatic shut-off and safety features are provided. The apparatus will be used to test both military and civilian aircraft tires.

Sees More Tire Sales

B. F. Goodrich Tire Co.'s president, E. F. Tomlinson, has anticipated that the tire industry will sell about 18% more tires during the first quarter of 1959 than it did during the similar 1958 period. Passenger-car tire sales are expected to reach 23,325,000 units this quarter, compared with 19,717,000 in the first three months of 1958, for an increase of more than 3,600,000, he stated in a recent series of regional sales meetings. Sales of winter-traction tires are running far ahead of those in 1958. It is likely that more than 5,000,000 winter tires will be sold this season, he reported, which would represent an increase of some 25% over the 4,201,000 snow tires sold last winter.

Thiokol Pays Tribute to Early Pioneers In Synthetic Rubber, at Princeton Dinner

Thiokol Chemical Corp. paid tribute to those in the rubber and associated industries who had a part in the early pioneering work on synthetic rubber in this country, at an informal cocktail party and dinner at the Princeton Inn, Princeton, N. J., January 9.

As Thiokol said in its dinner program souvenir booklet, "When we mention pioneers, we were thinking of those unbeknighted souls who suffered through synthetic rubber in the Thirties."

J. W. Crosby, president of Thiokol, acted as host, assisted by H. R. Ferguson, executive vice president and treasurer, and S. M. Martin, vice president and secretary, for the approximately 50 "pioneers" present at the dinner.

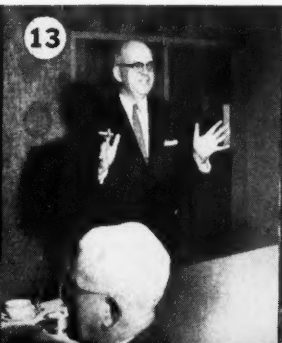
At the dinner Mr. Crosby called upon many of those present for their personal comments and reminiscences concerning their work with and use of the Thiokol polysulfide rubbers, the neoprenes, the nitriles, butyl, and the early general-purpose styrene-butadiene rubbers. Among the recollections were those concerning the World War II period when the polysulfide rubbers almost became general-purpose rubbers for tire use. The accompanying photographs show some of these men recounting their early experiences with these synthetic rubbers.

On the lighter side there was some excellent story telling and the vocal efforts of a trio composed of H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Corp.; R. P. Dinsmore, Goodyear Tire & Rubber Co.; and Bruce Silver, recently retired from New Jersey Zinc Co.

As a part of the above-mentioned souvenir booklet of this occasion was a "History of the Synthetic Rubber in America," by Peter P. Pinto, who retired as general manager of *Rubber Age* a few years ago. In Mr. Pinto's absence, this contribution was read by M. E. Lerner, present general manager and editor of that publication, and is reproduced below:

"Where does the history of synthetic rubber begin? Shall we start it with the scientists who first worked on the chemical analysis of rubber, like Faraday, Dumas, Himley, and A. Bouchardat? Shall we begin with those concerned with isoprene, such as Greville Williams, G. Bouchardat, Tilden, Wallach, and Ipatieff? Should we trace it to those who worked on experimental polymers, including Harries, Hofmann, Holt, Earl,

Recounting their experiences with the early synthetic rubbers: (1) M. E. Lerner, *Rubber Age*, reading P. P. Pinto's "History of Synthetic Rubber in America"; (2) R. P. Dinsmore, Goodyear Tire & Rubber Co.; (3) H. R. Ferguson, Thiokol Chemical Corp.; (4) W. L. White, Raybestos-Manhattan, Inc.; (5) C. A. Bartle, E. I. du Pont de Nemours & Co., Inc.; (6) L. A. Wood, National Bureau of Standards; (7) Joseph Crosby, Thiokol; (8) A. E. Juve, The B. F. Goodrich Co.; (9) J. G. Barbour, Chicago Rawhide Mfg. Co.; (10) R. D. Gartrell, United States Rubber Co.; (11) Sam Martin, Thiokol; (12) H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Corp.; (13) W. J. McCortney, The General Tire & Rubber Co.; (14) G. H. Swart, General Tire

Spence, Fisher and Ostromislensky? Should we commence with those who developed the first commercial polymers like Patrick, Nieuwland, Carrothers, Sparks, and Thomas? Or do we begin with those concerned with the commercial usage of the various polymers and copolymers—the Longstreths, Fergusons, Bridgwaters, Coslers, Byams, Bartles, Murawskies, Andrews, Boyds, Coes, Caseys, Dinsmores, Kovacs and others too numerous to mention who sparked the modern synthetic rubber industry?

"In the final analysis, the present-day synthetic rubber industry owes its existence to the work and perseverance of many scientists, technologists, researchers, laboratory assistants. Although some synthetic rubbers stem from the work of individuals, most of them can be properly attributed to groups or teams in which single elements contributed to the whole. While the status of the present-day industry obviously had its birth with World War II, this was only a circumstance which speeded up the process. Sooner or later synthetic rubbers would have taken their rightful place in the world's economy. This is fact, not fiction. Let's remember that the ground work was laid in the '20s, by the polysulfide and chloroprene rubbers.

"There are many ways to measure the success of an industry. In the case of synthetic rubber it might be pointed out that current production capacity equals that of the natural product. It took the latter well over 100 years to reach its position. It has taken synthetic rubber less than 30 years. True, there are many economic and industrial factors involved in this comparison, but the fact remains that production capacity for both natural and synthetic rubber is currently pegged at approximately 2,000,000 tons each!

"To all the multitude who contributed to the impressive record of the synthetic rubber industry—living and dead—we salute them as Pioneers of the Synthetic Rubber Industry!"

Polymer Sales Staff Appointments Made

J. T. Fitzgerald, S. C. Kilbank, and T. L. Davies were appointed area sales managers; E. E. Gale was named supervisor, technical services; and W. W. Winskill, supervisor, commercial services, by the marketing division of Polymer Corp., Ltd., Sarnia, Ont., Canada. The announcement of these organizational changes was made by J. T. Black, general sales manager. Mr. Fitzgerald becomes area sales manager for Latin America, the Far East, and Australasia. He has been serving as a sales supervisor in the Sarnia office since 1956. Prior to joining Polymer Corp. he worked in production and administration with the Goodyear Tyre & Rubber Co., and Avon Rubber Co., of England.

J. T. Fitzgerald

T. L. Davies

S. C. Kilbank

Mr. Kilbank will be sales manager for Europe, the Middle East, and Africa. He succeeded Mr. Fitzgerald as technical sales representative in London, England, in 1955 and was appointed sales supervisor in 1956. Mr. Davies will be area sales manager for Canada and the United States. He has been with the sales and technical service division since 1949. He also was appointed sales supervisor in January, 1956. He is a former chairman of the Division of Rubber Chemistry of the Chemical Institute of Canada and is currently the Rubber Division Councilor to the General Council of the Institute.

Mr. Gale takes over the post of supervisor of technical services. He joined the sales and technical service division in 1953, following experience gained in the research and development pilot plant. Mr. Winskill, supervisor of the order section, has been appointed supervisor of commercial services. He joined Polymer in 1949 and transferred into the marketing group after a short stay in the technical service section.

Ky. Site for General's Third U. S. Tire Plant

The General Tire & Rubber Co., Akron, O., has selected Mayfield, Ky., as the site for its third domestic tire manufacturing plant estimated to cost between \$8-9 million. In southwest Kentucky, the site was chosen over 35 other locations for the factory because of its geographical access to growing tire markets of the Midwest and Central States and because of its abundant water, power, and gas resources.

Groundbreaking for the factory, which will incorporate the rubber industry's most modern machinery and production design, is expected to occur in early March. It is also expected that construction and equipment installation will be completed and manufacturing begun in 14 months.

The factory, which will be built on an 80-acre tract, will initially have 400,000 square feet of floor space. It will be basically a one-story, masonry construction providing a continuous-flow production design. It is expected that the new operation, at such time as it reaches its peak production, will employ nearly 1,000 persons. The plans for the operation are such that the plant can be readily expanded to four times its original size as the demand warrants it.

With the new factory, General Tire will have tire plants strategically located to supply all the nation's growing tire markets. Its other domestic tire manufacturing facilities are in Akron, O., and in Waco, Tex. Outside of the United States it operates tire manufacturing plants in 15 countries. The company's selection of Mayfield, Ky., for its plant was made after a two-year study.

Witco Chemical Host to Spanish Rubber Industry Productivity Team in New York

Witco Chemical Co., Inc., entertained the visiting Spanish Rubber Industry Productivity Team at a luncheon in the Chemists Club in New York, N. Y., January 15. Max Minnig, Witco President, presided at this luncheon meeting; and John Gifford, technical director at Witco, discussed quality and quality controls of carbon black for the rubber industry.

The object of the Spanish Rubber Industry Productivity Team's visit is to study, under the auspices of the International Cooperation Administration of our government, in the United States modern methods of manufacturing rubber products in order to increase the productivity of the Spanish rubber industry. The team is composed of a group of 10 representatives of the Spanish Association of Manufacturers of Rubber Products selected by the National Commission for Industrial Productivity of the Government of Spain.

The interests of the Team include plant layout, production planning, manufacturing methods, modern machinery, management organization, etc. In addition, the members wish to study sales techniques and their organization including advertising and sales promotion. Other special interests embrace quality control, research and development, industrial standards, and management in general.

Carbon Black Quality and Control

Mr. Minnig first welcomed the members of the Spanish team and then explained the history and activities of Witco Chemical Co., including Witco Chemical Co., Ltd., of England. He mentioned the oil-black plant being built in France by Witco and Phillips Petroleum Co. to serve the rubber industry in France and Spain and other European countries. The availability of technical bulletins on compounding from Witco was emphasized.

The leader of the Spanish team, G. F. Letamendia, general manager, Caucho Especial, M. R. M. Sociedad Anma, then acknowledged with thanks the hospitality of Witco Chemical and Mr. Minnig and presented the Witco president with a remembrance souvenir from the Spanish Team.

In his talk on carbon black quality and its control, Mr. Gifford stated that in the near future a single recipe for measuring the properties of all carbon blacks, except thermal blacks, should be adopted. A copy of the recipe and other details were supplied to the Team members.

It was also explained that the mechanics of quality control of carbon black are developing into a system whereby the carbon black producer sends with each shipment to a rubber company the production control data of the carbon black in a rubber recipe. The purchaser tests tne shipment and compares its data with that furnished by the carbon black producer. If these comparisons show equivalent test results over a period of time, the carbon black company becomes a certified supplier and the rubber company no longer tests shipments of carbon black, but relies upon the control data furnished by the producer.

In summary, Mr. Gifford cited cooperation as the one fundamental factor in the solution of the problem of carbon black quality. With free discussion between the carbon black producer and its customers of common problems, the interchange of ideas, test methods, and samples and with considerable expenditure of time and money, very real progress will continue, he said.

Team Itinerary

The itinerary of the Spanish Team, which arrived in this country on January 9 and returns to Spain about February 21, includes meetings with The Rubber Manufacturers Association, Inc., Texas-U.S. Chemical Co., and Witco, in New York; Farrel-Birmingham Co. and American Cyanamid Co., in Connecticut and New Jersey; E. I. du Pont de Nemours & Co., Inc., in Wilmington, Del.; ICA, Department of Labor, and the American Council on Education, in Washington. Also, Texas-U.S. Chemical again, in Port Neches, Tex.; Phillips Petroleum Co., in Borger, Tex., and at Bartlesville, Okla.; American Synthetic Rubber Corp., Louisville, Ky.; Midwest Rubber Reclaiming Co., Barberton, O.; B. F. Goodrich Co. at Brecksville and Avon Lake, O.; Firestone International Co., in Akron; Faultless Rubber Co., in Ashland, O.; Hewitt-Robins, Inc., in Buffalo, N. Y.; Hood Rubber Co. Division of Goodrich, in Watertown, Mass.; and Godfrey L. Cabot, Inc., in Boston, Mass.

American Chemical To Build New Plant

American Chemical Corp., jointly owned by Stauffer Chemical Co. and Richfield Oil Corp., has completed plans to build a $7,500,000 petrochemical plant at Watson, Calif. Construction began in January, with completion scheduled for January, 1960.

Major products of the new venture will include ethyl chloride, ethylene dichloride, and vinyl chloride monomer. Also production plans include plastic polymers and copolymers as well as perchlorethylene and trichlorethylene.

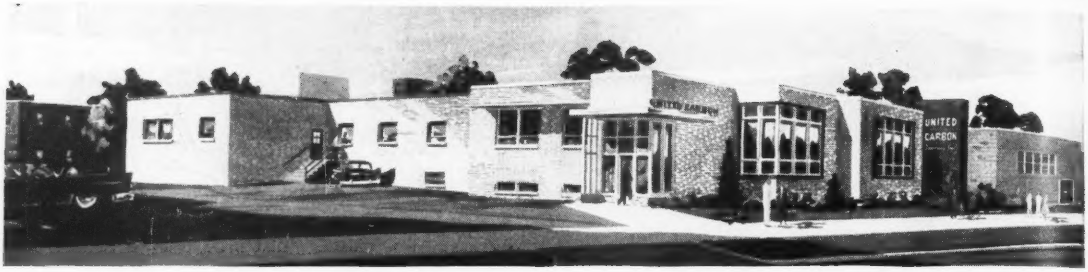
The plant will be located on a site adjacent to Richfield Oil's refinery. Raw materials for the petrochemicals to be produced will be supplied by the two parent companies.

The decision to build the new facilities was based on continued confidence in the steady industrial growth of the west, the company announced.

President of American Chemical is Hans Stauffer, also president of Stauffer Chemical Corp. David E. Day, vice president of manufacturing of Richfield Oil, is a vice president of American Chemical. Other vice presidents are C. A. Day, John Stauffer, and Roger W. Gunder.

Charles A. Lindsay, vice president and general manager of Stauffer's molded products division, has been named vice president and general manager of American Chemical. Other officers are W. T. Autrey, comptroller; James W. Kettle, treasurer; C. B. Downey, assistant treasurer; Norman F. Simonds, secretary; David Guntert, assistant secretary.

Witco President Max Minnig welcoming Spanish Rubber Industry Productivity Team at luncheon meeting in New York



Architect's drawing of United Carbon's Akron sales technical service laboratory

United Carbon Builds Sales Service Lab

United Carbon Co., Inc., Charleston, W. Va., has begun construction of a sales technical service laboratory in Akron, O. The laboratory is designed to assist the rubber industry and allied manufacturers directly in making the most effective use of United's products, which comprise carbon blacks and SBR black masterbatches.

Construction of the new laboratory marks a major step in the continuing growth of the company's research, development, and sales technical service program. The new building will have complete facilities of an initial staff of approximately 20 scientists, engineers, and technicians.

All rubber industry companies will be invited to take advantage of the laboratory's facilities, including those for technical services in connection with the use of United's products in plastics and paints.

Frank O. Holmes, Jr., manager of sales development, will direct the Akron lab's activities upon its completion late this summer. He has 25 years' experience in production phases of the rubber industry.

The modern masonry and steel laboratory will have nearly 11,000 square feet of working space. The new building includes five offices, six laboratories, and a library on its main floor. The laboratory space has provisions for rubber mixing, compounding, and milling, and a press room. The basement provides room for additional offices and laboratory space, a conference and lunch room, test rooms, and essential power service facilities.

Cobalt 60 at Goodyear

A new supply of radioactive Cobalt 60 has been installed in The Goodyear Tire & Rubber Co.'s radiation research laboratory, Akron, O., increasing the strength of the present radiation source to 3,600 curies. The company plans to raise the energy level eventually to 10,000 curies.

The fully equipped radiation laboratory, said to be the first of its kind in the rubber industry, was opened two years ago with a radioactive source of 2,100 curies. The additional Cobalt 60 will enable Goodyear scientists to make more extensive studies in the field of radiation research. They are currently conducting studies on damage done to various rubber and plastic products by radiation, possibility of using radiation as a means of vulcanization and as a treatment to improve product quality.

When not in use, the radioactive source rests at the bottom of a concrete and aluminum lined well under 17 feet of water. The "Cave," a separate part of the radiation laboratory, into which the cobalt is raised on an elevator when experiments are to be conducted, has reinforced concrete walls four feet thick and a roof three feet thick.

The Cobalt 60 was shipped to Goodyear in a special lead container weighing 3¼ tons from Atomic Energy, Ltd., Chalk River, Canada.

General Tire's Safety Contest Winners

The General Tire & Rubber Co., Akron, O., recently concluded its highway safety essay contest for college scholarships and announced the winners. The 20 winners' sincere and thoughtful answers as to what can be done to assure greater highway safety in the United States ranged from a need of additional legislation to suggestions for highway improvements.

First prize of $1,000 scholarship went to Bernard W. Webber, a junior at the University of Minnesota. Robert M. Crunden, a freshman at Yale, won the $900 second prize, and third prize of $850 was awarded Margaret A. Kirchoff, a high school senior in Birmingham, Ala.

Pointing to the need of common courtesy on the road as a factor in alleviating the traffic toll, some of the winners praised scholastic driving and traffic safety classes and stressed the need of more of the same.

Recommendations made by winners were: "Get tough with speeders," advised Webber, pointing out that 38% of all fatal accidents are caused by excessive speed: "People will slow down to avoid inconvenience or save money, if they won't do it to save their lives," said Crunden, recommending laws which would take licenses from speeders; and Miss Kirchoff, whose father was killed in an automobile accident, wrote that the "teaching of safety on highways should be an integral part of the education of every child."

General Tire's highway safety essay contest began last August and concluded December 1. It was part of the company's Safer Driver Campaign started last May. Winners in the essay contest were selected by Ivan L. Eland, of the National Safety Council; Joseph Intoore, president of the American Driver & Safety Education Council, Penn State University; and Charles A. Mooney, Cleveland School Board president.

UCC Marketing Change

Victor H. Boden has been appointed manager, product marketing, for Union Carbide Chemicals Co., division of Union Carbide Corp., New York, N. Y. He now heads a group of five product sales managers and, with them, has the responsibility for planning and marketing direction of the firm's industrial chemicals.

The product sales managers are Robert C. Boltz, Howard L. Harwell, Robert B. Leonard, Frederick J. Rauscher, and John M. Russ. Boltz was eastern division sales manager, and Harwell, assistant product sales manager. Each of the five is responsible for certain groups of chemicals: Boltz for plasticizers, monomers, and higher alcohols; Harwell for glycols, amines, oxides, and Niax polyols; Leonard for ester and ketone solvents, lower alcohols, and ethers; Rauscher for acids, anhydrides, aldehydes, chlorinated compounds, and glycol-ethers; and Russ for Ucon functional fluids and lubricants.

Merritt A. Bigelow, Jr., Philip G. Magnusson, and Lester D. Polderman were named assistant product sales managers. Bigelow will assist Russ. Magnusson, formerly sales manager of vinyl calendering resins for Union Carbide Plastics Co., will assist Boltz. Polderman, previously manager of engineering services, technical service, will assist Harwell.

Sales Changes Made By U. S. Rubber Co.

United States Rubber Co., New York, N. Y., has combined sales responsibilities for coated fabrics and foam rubber cushioning, effective January 1. The move was designed to give better service to furniture manufacturers and distributors, it was said.

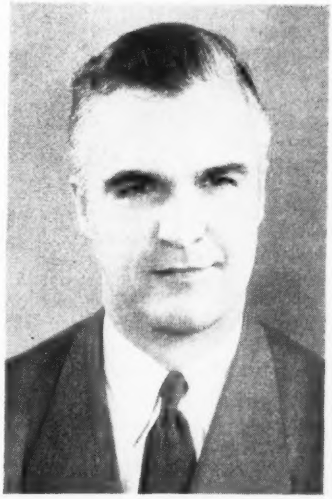
William J. Mulvey was named sales manager of the newly combined departments, responsible for sales of Koylon foam seating as well as Naugahyde upholstery and other coated fabrics.

Charles H. Baldwin was appointed sales manager of Koylon foam seating, reporting to Mulvey. His headquarters will be in the company's Mishawaka, Ind., plant. John Brady was promoted to sales manager of coated fabrics made in the Mishawaka plant; while Thomas Martin continues as sales manager of coated fabrics made in the Stoughton, Wis., plant. Both report to Mulvey.

Five regional sales managers of Koylon foam seating, Naugahyde upholstery, and other coated fabrics were also named. Jack L. Bonnell will be regional sales manager for the West Coast, headquartering in the company's Santa Ana, Calif., plant. Robert Gardner will be regional sales manager for the central region: Joseph P. Gavin, for the Midwest; and Edgar J. Artesani, for the South. All three will headquarter in Mishawaka plant. Earl Kochersperger will be regional sales manager for the East, with headquarters in Rockefeller Center, New York.

Pach Bros., N. Y.

William J. Mulvey



Charles H. Baldwin

John Brady

Carlisle Corporation Acquires Tensolite

The Carlisle Corp., Carlisle, Pa., recently acquired the Tensolite Insulated Wire Co., Inc., Tarrytown, N. Y. The purchase was announced jointly by George F. Dixon, president of Carlisle, and C. Harrison Minich, president of Tensolite. The wire company will function as a wholly-owned subsidiary of Carlisle and will undergo no change in present officers, personnel, or policies.

Tensolite is one of the leading manufacturers of high-temperature, Teflon-insulated wire and cable. Its products are widely used in guided missiles, rockets, jet aircraft, radar, and other electronic and electrical applications. In 1958 a new addition to the Tarrytown plant was completed that more than doubled Tensolite's manufacturing capacity. The broad distribution and marketing organization of Carlisle is expected to provide further growth and expansion.

The Carlisle Corp. is a diversified manufacturer of rubber and plastics products. Founded in 1917 as the Carlisle Tire & Rubber Co., it became the Carlisle Corp. in 1948 when its molded materials division in Ridgway, Pa., was acquired. In 1954, Carlisle purchased Stoner Rubber Co., Anaheim, Calif., an operation devoted mainly to producing rubber goods for the aircraft industry, which is also an important segment of Tensolite's market. Last year Carlisle acquired Geauga Industries Co., manufacturer of mechanical goods and plastic extrusions for the automotive and appliance industries, with plants in Crestline and Middlefield, O.

Porter and Thermoid Complete Merger

A a result of action taken by the respective boards of Thermoid Co., Trenton, N. J., and H. K. Porter Co., Inc., Pittsburgh, Pa., Thermoid, a manufacturer of industrial and automotive rubber and friction parts, became a part of the new Thermoid division of H. K. Porter Co., Inc., on December 11.

Porter's new division will manufacture and market products formerly made by Thermoid Co. and the various works of Quaker Rubber Division.

Coincidentally with the merger, the board of the parent company was expanded from six to nine members, to include Warren E. Hill, president of Thermoid, Hans Eggerss, and W. Stuart Landes, all former members of Thermoid Co.'s board of directors.

The new Porter division is headed by Hill as vice president and general manager, George Dauphinais as vice president-operations, and sales organization by J. R. Alexander, vice president-marketing, and E. G. Counselman, general sales manager. The managers of the 12 sales districts will be responsible for both automotive and industrial products, and will report to three regional sales managers: East, Midwest, and Pacific.

The product lines maufactured by Thermoid and by Porter's Quaker Rubber division are complementary; the consolidation will provide from Porter's Thermoid division a broader line, manufactured under both well-known brand names; higher quality standards; improved manufacturing facilities; and the strengthening of research, development, and marketing.

Thermoid's main plant is located in Trenton, N. J. Other plants are at Charlotte, N. C.; Nephi, Utah; Danville, Ill.; and Huntington, Ind. Thermoid of Canada, Ltd., is at Welland, Ont.; and Thermoid de Mexico, S.A., has a plant in Mexico City which manufactures brake lining.

To these former Thermoid Co. plants, in Porter's new division, are added the former Quaker Rubber division's manufacturing facilities at Philadelphia, Pa., and Pittsburg, Calif.; and Aero-Duct Works at Chanute, Kan.

Industry News

Virtis Uses Urethane Foam to Produce Efficient, Unbreakable "Dewar Flasks"

A new solution to the problem of fragile glass Dewar flasks which are extremely subject to breakage has been found by the Virtis Co., Inc., Gardiner, N. Y. M. C. Parkinson, vice president, reports that Virtis is producing a new type of unitized container utilizing a rigid urethane foam to provide satisfactory insulation for the storage of very cold liquids.

This container is light in weight, warm to the touch, never needs re-evacuation, and, above all, is unbreakable. The units, known as insul-steel containers, are available in four sizes from one liter to eight liters' capacity and can be used for storage of dry ice, liquid nitrogen, or any other material at temperatures ranging from —328 to +225° F.

Urethane for Strength

The urethane foam, produced from materials obtained from Nopco Chemical Co., Harrison, N. J., gives both insulation and structural strength to the unit. The foam has a density of eight pounds per cubic foot and has a closed-cell structure which adds to its superior insulating properties by preventing convection currents. These currents in a structure such as fiber glass or other open-weave insulation cause a noticeable effect on its insulating efficiency.

The cells of the foam are filled with an inert gas (carbon dioxide) of low thermal conductivity, contributing to its low heat transfer rates. In fact, at lower temperatures the gas condenses, leaving a better vacuum and improving the insulating value.

Another valuable characteristic of the foam is its negligible water absorption. Frozen moisture in the insulation can provide direct paths for heat transfer by conduction.

Allied Chemical Corp.

Fig. 2. Since the foam starts to rise immediately, the inner steel container wrapped in a cardboard "expansion joint" is quickly inserted, then clamped in position.

The foam, in effect, forms the outer container of the unit, in which a stainless-steel bucket is embedded. Even if the container is dropped from workable height, the foam deforms slightly and absorbs the impact. Unless the foam is cracked in a transverse direction, the bucket will continue to be perfectly serviceable.

Manufacturing Procedure

Except for the stainless-steel inner bucket, every other component is rubber or plastic. Even the mold used is made of plastic.

The outer covering is made of vacuum-aluminized, vinyl-backed, Mylar[1] sheet. This is cut to the approximate size, and an adhesive is used to form it into a tube, which is inserted into a mold made from standard lucite tubing, and trimmed to the exact height.

The steel bucket is wrapped in a layer of corrugated cardboard, which acts as an expansion joint in the finished unit to allow for the different shrinkage characteristics of the steel and foam when used at low temperatures. The cardboard prevents excessive stresses from forming and cracking the insulation.

The various components are now ready for the addition of the foam. The foam mixture is prepared by taking, for a one liter-size bucket, two pounds of prepolymer formulation C608 made by Nopco and adding 1½ pounds of activating isocyanate. (See Figure 1.) The mixture is agitated for about one minute, until the color changes to a light straw and the viscosity drops noticeably. The urethane mixture is quickly deposited into the mold, and the bucket and cardboard assembly lowered into it (see Figure 2).

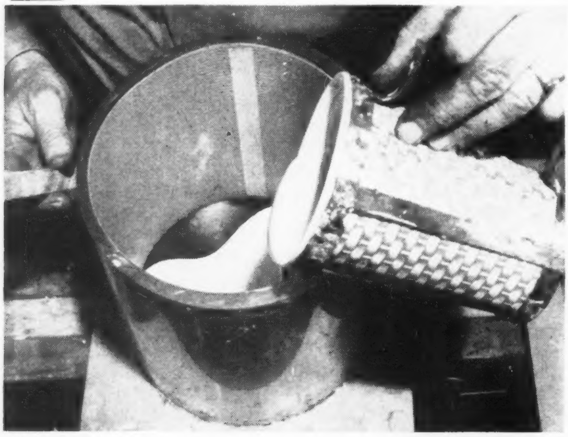
The bucket is held in position by a split-ring collar and clamped by a screw jack. Thus the foam is held under pressure while curing which, along with the exothermic heat of the reaction, causes the foam to harden in about one hour.

The final step is to coat all exposed edges with three layers of a neoprene-based paint to seal the foam against any solvents such as in a dry ice/acetone slurry.

Urethane As Insulation

Several laboratory tests as well as three years of actual use have shown the urethane foam insulation to be highly effective. In addition, the aluminized, non-tarnishing outer skin cuts down on heat transfer by radiation.

[1]E. I. du Pont de Nemours & Co., Inc. Wilmington, Del.

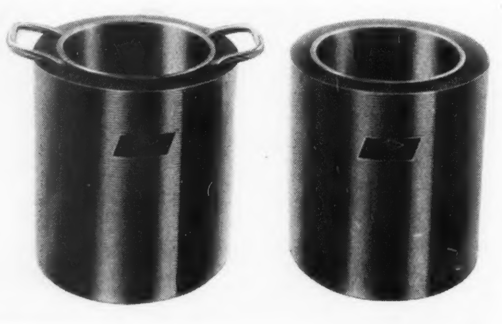


Allied Chemical Corp.

Fig. 1. As soon as foaming of the prepolymer and activator mixture starts, the urethane is poured into the mold containing the Mylar outer surface and the cardboard interliner. The cement used to adhere the foam to the bottom of the container is visible also.

Fig. 3. Completed unbreakable urethane insulated flasks for storage of cold liquids in the laboratory

Allied Chemical Corp.



NEWS BRIEFS

ENJAY CO., INC., *New York, N. Y., has announced that all grades of its butyl rubber, except 165, are now available in a new multi-unit package.* This new package, consisting of 48 individual bales, polyethylene wrapped and weighing approximately 2,800 pounds, has been designed for customer convenience in unloading, handling, and storing butyl rubber. Also, Enjay will continue to supply butyl in individual cartons. A brochure which describes the features and advantages of the multi-unit package is available from the company.

THE KELLY - SPRINGFIELD TIRE CO. OF CANADA, LTD., *a subsidiary of Kelly-Springfield Tire Co., Cumberland, Md., is a new Canadian firm* with headquarters at 188 University Ave., Toronto, Ont., Canada. Starting initially in Quebec and Ontario, the company will market a complete line of passenger, truck, and farm tires and tubes. Distributors will be appointed shortly.

DISOGRIN INDUSTRIES, INC., *Mt. Vernon, N. Y., has announced that its Disowheel line of industrial truck wheels now has been expanded to include a series of standard industrial wheels.* These wheels employ the polyurethane, Disogrin, as the tire material. The high load-carrying capacity characteristics of Disogrin allow a given wheel size to carry a greater load capacity, or, conversely, offers the advantage of permitting the use of a smaller wheel to carry a given load. Standard Disowheels are available in sizes which are in accordance with the dimensional standards established by the Caster & Floor Truck Manufacturers Association, and most sizes are carried in stock for immediate delivery.

POLYMER CORP., LTD., *Sarnia, Ont., Canada, has announced that five local high school students at Sarnia will be the recipients of special scholarship prizes.* The prizes, open to all students of Sarnia high schools, are designed to give recognition to the top students in industrial, commercial, and special commercial courses. The prize winners will receive their awards from the company at the regular school commencement and presentation programs.

MONSANTO CHEMICAL CO., *plastics division, Springfield, Mass., has announced a decrease of* $\frac{7}{10}$¢ *a pound in the bulk price of rubber grade styrene monomer, effective April 1.* The new price will be 12¢ a pound. Also announced was the completion of a 40-million-pound increase in the rated capacity of the company's styrene monomer plant, Texas City, Tex., making it one of the largest styrene monomer installations in the world. The price reduction is made possible primarily by the company's additional capacity, which was achieved by improving processes and adding auxiliary equipment at minimum cost. The company recently completed an expansion for ethylene, which is used in the production of styrene monomer as well as in the manufacture of its polyethylene and its vinyl chloride monomer.

THE B. F. GOODRICH CO., *Akron, O., reports that 31 scientists at the company's research center at Brecksville, O., have gone "back to school" to study Russian.* The group, studying under Dr. Thais Lindstrom, Western Reserve University, Cleveland, O., represent members of practically all the career groups in the center. Many of the group are already multilingual, with Russian being a fifth language for some. Their goal is mastery of technical Russian to enable them to read Russian journals in the original, thus saving the time and the expense of translation. Dr. Lindstrom was born in Russia and has won national recognition for her course in Russian conducted over WEWS-TV (Cleveland).

E. I. DU PONT DE NEMOURS & CO., INC., *Wilmington, Del., has awarded grants totaling nearly $1,200,000 to 139 universities and colleges* in its annual program of aid to education. The entire program is for fundamental research by universities for strengthening the teaching of science and related liberal arts in the 1959-60 academic year. Du Pont has nearly doubled its grants for unrestricted research in the physical sciences because of the growing need of this type of work, which the company has been supporting since 1949.

J. M. HUBER CORP. *is moving its main offices from 100 Park Ave. to 630 Third Ave., New York 17, N. Y.,* effective February 9. The new phone number will be YUkon 6-8484.

CATALIN CORP. OF AMERICA, *New York, N. Y., will use the proceeds of a loan from Dow Chemical Co. for expansion and to call in its outstanding preferred stock.* Dow Chemical has invested $2,300,000 in Catalin by purchasing a subordinated convertible note. Of this sum, $850,000 will go to call in the stock, and the rest will be put into the Catalin general fund, with a large portion earmarked for the expansion plans.

UNITED STATES RUBBER CO., *New York, N. Y., is supplying Ensolite, a closed-cell vinyl sponge, to Skope Mfg. Corp., Norwood, Mass. for use in the Skope safety suit for skin diving.* The suit was designed by Tom Skope, a professional skin diver, and is sold in kit form. Advantages of the suit are its ability to be made in color for better visibility, its natural buoyancy so that the diver need only release his weight belt rather than have to inflate a belt around his waist, to get him to the surface in an emergency. A further advantage is that the user need not powder the inside surface of the suit in order to get it on. A quick dip in water provides sufficient slip to allow the suit to put on easily. The kit contains Ensolite material, patterns, glue, color touch-up, and complete instructions to make hood, jacket, pants, and sox.

RUBBERMAID, INC., *Wooster, O., has placed in national distribution the Ventura Kar-Rug, featuring color inserts, in a popular price range.* A new rubber compound developed by the company will be used for the first time in the new Ventura series. The Ventura, described as a twin-contour Kar-Rug, is available for both front and rear floors. The front floor set is shaped for taper and slope on either side of the hump, with the left side inset for the accelerator. The matching rear Ventura is rectangular and has universal application.

THE OKONITE CO., *Passaic, N. J., a subsidiary of Kennecott Copper Corp., has announced that Kennecott Wire & Cable Co., Phillipsdale, R. I., has become an operating division of Okonite.* In becoming a division of Okonite, it will be known as The Okonite Co., Kennecott Wire & Cable Division. A. F. Sheldon, Kennecott's head, will become administrative executive at the Phillipsdale plant, reporting to Okonite's president, R. Stuart Keefer. The operations at Phillipsdale will continue to be handled by the present staff.

News Briefs

SHELL CHEMICAL CORP., *Torrance, Calif., has announced that effective January 1 its policy regarding the return of Flotainers and pallets has been changed.* The company now will pay freight charges on the return of Flotainer sides and all pallets shipped from its Torrance plant after that date. In order to maintain accounting control, its policy of invoicing for both pallet and Flotainer deposits will be retained. The Flotainer is a modern packaging method for storing and handling the company's SBR rubbers.

PATCLIN CHEMICAL CO., INC., *Yonkers, N. Y., has developed a stripper-cleaner for the removal of baked-on carbon, latex, and foam rubber from aluminum molds,* designated Patclin #918. It may be used either concentrated or diluted with up to three parts of water, hot or cold. The dilution and the temperature depend upon the type and the amount of build-up on the mold and the speed of strip-cleaning desired. Being acid based, this new material is used hot in stainless-steel tanks and cold in ceramic crock. It is shipped in 13-gallon carboys or in 55-gallon stainless-steel returnable drums.

MONSANTO CHEMICAL CO., *St. Louis, Mo., has completed a 25% expansion of its production capacity at Everett, Mass., for phthalate ester plasticizers* which are added to vinyl and other theormoplastic resins to give them flexibility. This is the third major expansion of these facilities within the past five years; the capacity now is three times that of the original unit constructed in 1953. The company markets more than 70 different plasticizers; the large majority of these is phthalate esters.

THE GOODYEAR TIRE & RUBBER CO., *Akron, O., has renamed two of its most popular passenger tire lines.* Its Deluxe Super-Cushion tire was renamed the Safety All-Weather, and its Super-Cushion tire was changed to All-Weather. Tire appearances, construction features, sizes, and prices are not affected. The change was made to make it easier for the consuming public to recognize quality lines through tire identification.

THE FIRESTONE TIRE & RUBBER CO., *Akron, O., has been awarded a contract of $5,860,000 by U. S. Army Ordnance for the continued production of Corporal guided missiles.* Firestone has been producing the Corporal in its Los Angeles plant since 1951. The Corporal, a surface-to-surface guided ballistic missile, is capable of carrying either a regular or nuclear warhead, has a range of more than 75 miles, and is powered by a rocket motor which propels it at supersonic speeds.

EASTMAN CHEMICAL PRODUCTS, INC., *New York, N. Y., has announced that its plastics division has established a new sales territory with headquarters in Greensboro, N. C.* Manager of the new office, at 435 Jefferson Standard Building, is John M. Marvin, who comes to the new post after more than 11 years with the company, most recently as sales representative at Leominster, Mass. The new territory will include Virginia, North Carolina, and parts of South Carolina, Tennessee, and Kentucky. Other regions in the area formerly served by the company's Atlanta, Ga., sales office will continue to be served by that office.

BLAW-KNOX CO., *Pittsburgh, Pa., has made a proposal to purchase for cash the assets, exclusive of cash and receivables, of Aetna-Standard Engineering Co.,* which operates plants in Warren, O., and Ellwood City, Pa. The latter company's principal business is the design and manufacture of seamless and buttweld pipe mills; cold drawing equipment; processing equipment and related auxiliaries for sheet, tinplate, and other flat mill products; and specialized equipment for the plastics and rubber industries. These products would represent supplementary lines for Blaw-Knox.

SHERWIN-WILLIAMS CO.'S *pigment, color, and chemical division, New York, N. Y., is now offering a clean primrose-shade yellow pigment,* called Strontium Chromate 12170. Because of its excellent light and heat resistance, the new pigment is widely used in polyvinyl chloride resins to produce pastel primrose yellows. It is similar in shade to Primrose Chrome Yellow, but has considerably better light and heat stability. More detailed information about this pigment is given in Technical Bulletin C-75, available from the company.

PARKER-HANNIFIN CORP., *Cleveland, O., has made arrangements to purchase a plant in Lexington, Ky., which will help supply the rapidly developing eastern market for the company's combination rubber and metal seals.* The new facility, recently owned by Kawneer Co., will manufacture gaskets, packings, and seals for the missile, aircraft, automotive, and other industrial markets. It has approximately 500,00 square feet of readily usable manufacturing space, all on one floor.

SINCLAIR CHEMICALS, INC., *New York, N. Y., has changed its name to Sinclair Petrochemicals, Inc.,* 600 Fifth Ave., New York, N. Y. All personnel, offices, and operations remain unchanged. Sinclair Petrochemicals is a wholly owned subsidiary of Sinclair Oil Corp.

COLUMBIAN CARBON CO., *New York, N. Y., has appointed B. E. Dougherty Co. as its West Coast representative* to handle its complete line of carbon blacks, iron oxides, lamp blacks, dispersions, and plasticizers. Dougherty has represented raw material manufacturers to the rubber, paint, and plastics industries on the Coast for more than 25 years. With offices located in Los Angeles and San Francisco, the Dougherty staff of six technical salesmen will cover California, Washington, and Oregon.

GOODYEAR TIRE & RUBBER CO., *Akron, O., has developed a polyurethane-type synthetic rubber solid industrial tire* said to have four times the wearing qualities of conventional industrial tires. Made from Neothane, the tires are designed for pallet roller wheels and steer wheels and currently are being produced on a pilot-plant scale. The new material has high resistance to cutting and chipping, as well as excellent oil, weather, and abrasion resistance. High load bearing is another outstanding feature. This tire also reduces floor maintenance costs and protects equipment and loads against damaging shock through its cushioning action.

NAUGATUCK CHEMICAL DIVISION, UNITED STATES RUBBER CO., *Naugatuck, Conn., is supplying Kralastic, a resin-rubber blend, which is being injected molded into impellers for sump and jet water pumps* made by Barnes Mfg. Co., Mansfield, O. Cost is the prime reason plastic is being used, rather than cast-bronze. Also, there is virtually no variation in size or shape, and the plastic parts have smoother surfaces which aid water passage and contribute to greater operating efficiency, according to Barnes. The sump pump impeller is molded for Barnes by Portage Plastics, Kent, O.; the unit for the jet pump is molded by General Industries, Marysville, O.

WESTERN ELECTRIC CO., *New York, N. Y., has signed a contract with the U. S. Atomic Energy Commission under which Sandia Corp. will continue operation of the Sandia Laboratory at Albuquerque, N. M., and Livermore, Calif., for five more years.* Sandia Corp., wholly owned subsidiary of Western Electric Co., Inc., operates the laboratory for the AEC on a non-profit basis as a design and development agency in the nation's nuclear weapons program. Sandia is the AEC's major laboratory for the ordnance phases of nuclear weapons research and development. The contract enables Sandia Corp. to draw as required upon all divisions of Western Electric and Bell Telephone Laboratories and other Bell System companies for scientific services, technical and managerial assistance.

THIOKOL CHEMICAL CORP., *Trenton, N. J., has been awarded a contract for research, development, and delivery of an unspecified number of improved high-performance XM33 solid propellant rocket motors.* The contract, issued by the Army Rocket & Guided Missile Agency for the NASA, was in the amount of $2,383,173. Work on this motor, originally designed for the Navy Polaris test vehicle, will be done at the Redstone Division of Thiokol Chemical Corp.

C. W. BRABENDER INSTRUMENTS, INC., *South Hackensack, N. J., has announced the appointment of Harry G. Uphouse Co., Bala-Cynwyd, Pa., as direct factory representative.* The Uphouse organization will be the exclusive agency for Brabender physical testing instruments in eastern Pennsylvania, Delaware, Maryland, and southern New Jersey.

POLYMER CORP., LTD., *Sarnia, Ont., Canada, is adding to its storage facilities for rubber.* The company has announced that the structure, to be built in the Spring of 1959, will double the storage area available. Cost is estimated in excess of $500,000 for the two-section building. Each section will be approximately 450 by 200 feet. The structure will be of preformed laminated wood, single span arched trusses, on a metallized concrete floor with a fiber-glass covered plywood roof and will feature rail and truck loading docks.

NEWS about PEOPLE

H. W. Mohrman has been appointed to the newly created position of director of research-associated interests for Monsanto Chemical Co.'s plastics division, Springfield, Mass. Also, **R. J. Schatz** has been promoted to director of research for the division, replacing Mohrman. Both changes became effective January 1, 1959.

J. T. Black, assistant sales manager since 1954, has been made general sales manager, Polymer Corp., Ltd., Sarnia, Ont., Canada. He joined the company in 1946 as a technical service representative. During his career with the sales division he has traveled extensively for the company in Europe, Japan, and South America.

Robert M. Aude has been appointed vice president and general manager of the Heyden Chemical division of Heyden Newport Chemical Corp., New York, N. Y. The division produces intermediate chemicals and other products for the paint and varnish, pharmaceutical, and chemical processing industries.

Robert L. Daub, formerly with American Latex Products Corp., has taken a position with the Caram Mfg. Co., Monrovia, Calif., according to F. C. Johnston, president of Caram Mfg.

Stanley T. Ulmer, production superintendent of The B. F. Goodrich Co., Akron, O., Akron tire plant, has been named manager of the company's Oaks, Pa., tire plant. He replaces **W. L. Carpenter,** who is transferring to Australia. A graduate of the University of Akron, Mr. Ulmer joined Goodrich in 1941. After filling several supervisory positions he was named night superintendent of the tire division in 1950 and in 1951 was made general foreman of the division.

Michael Storti has been elected president and general manager of the Rhee Elastic Thread Corp., Warren, R. I. He succeeds **Daniel Rhee,** founder of the business, who has been elected chairman of the board of directors and who will continue in his position as treasurer. Rhee, who established the elastic thread firm in 1946, will devote his efforts to the development of new products for the implementation of the company's present line.

B. Bruce Marr has been named general manager, Naugatuck Chemicals & Latex and Reclaim divisions, Dominion Rubber Co., Ltd., Montreal, P.Q., Canada. Since 1941 he had been manager, Naugatuck Chemicals Division, Elmira, Ont. **Frank D. Evans** succeeds Marr as manager in Elmira. Evans had been sales manager there since 1946.

Frank T. Williams, manager of the tire yarn sales division of American Viscose Corp., has been named chairman of the merchandising advisory committee of Tyrex, Inc., New York, N. Y. The committee comprises sales representatives of five major manufacturers of tire yarn and cord who formed Tyrex, Inc., some time ago to promote the revolutionary new Tyrex viscose tire cord.

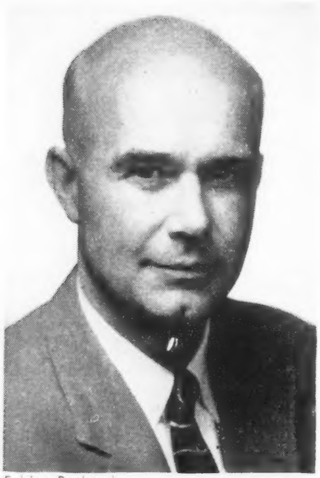
John E. Powers and **Arthur H. Rude** have been appointed directors of The General Tire & Rubber Co., Akron, O., to fill vacancies on the 17-member board. The appointees will serve out the unexpired terms of **W. E. Fouse,** cofounder of the company who died last July 22, and that of **B. E. Smith,** who resigned recently. Powers is vice president in charge of the company's plastics operations, and Rude is executive vice president of Aerojet-General Corp., General Tire's rocket subsidiary. Once regarded as the largest tire dealer west of the Rocky Mountains, Rude has been affiliated with General or its subsidiary since 1919. Rude became a vice president of the Aerojet Engineering Co., now Aerojet-General, in 1944. He has served as executive vice president since 1949.

Paul F. Smith, general manager of Parker Seal Co. Division, Culver City, Calif., of Parker-Hannifin Corp., has been named president of that division. Also, **Scott A. Rogers,** assistant general manager, is now vice president; while **T. J. McCuistion,** sales manager, becomes vice president, sales.

Harry D. McNeeley, vice president of Tennessee Eastman Co., Kingsport, Tenn., has been named executive vice president of this Eastman Kodak Co.'s division. On assuming his new duties on January 1, McNeeley also became a vice president of three Eastman subsidiaries: Eastman Chemical Products, Inc., Holston Defense Corp., and Holston Trading Corp.

Thomas H. Pearce has been elected president of National-Standard Co., Niles, Mich., succeeding **A. H. Johnson.** The former was executive vice president for the past two years and prior to that had been vice president, engineering and manufacturing. Johnson, a N-S employe for 40 years and president since 1952, joins Walter H. Parkin as cochairman of the board of directors. **William D. Peace** and **Richard W. Elder** have been elected vice presidents, respectively, for rubber industry sales and specialty sales. Peace was assistant vice president, and Elder, general sales coordinator and manager of round wire sales. Also, **K. D. Smith** has been appointed special adviser on the rubber industry.

News about People



Fabian Bachrach

William J. Carpenter

Pach Bros., N.Y.

Walter F. Brown

Pach Bros., N.Y.

Herbert D. Smith

William L. Carpenter, manager of B. F. Goodrich Tire Co.'s Oaks, Pa., plant, has been chosen managing director of B. F. Goodrich Australia Pty. Ltd., a newly created subsidiary of International B. F. Goodrich Co. Carpenter, who has been associated with BFG for 23 years, will supervise the organization and management of the company at Melbourne, Australia. Construction of a BFG plant near Melbourne for the manufacture of tires and other products was started recently.

Frank R. Mayo, a senior research chemist at the Stanford Research Institute, Menlo Park, Calif., has been elected chairman of the American Chemical Society's Division of Polymer Chemistry for 1959. Professor Charles G. Overberger, of the Polytechnic Institute of Brooklyn, Brooklyn, N. Y., was named vice chairman, and Field H. Winslow, of Bell Telephone Laboratories, Murray Hill, N. J., was reelected secretary-treasurer. Dr. Mayo, an authority on the structure of rubber and plastics, is a member of the editorial board of the *Journal of the American Chemical Society*. He has written more than 70 scientific papers describing polymer research. Mayo was also a research chemist at the Jackson Laboratory of E. I. du Pont de Nemours & Co., Inc., Deepwater Point, N. J., from 1933 to 1935, and in 1942 joined United States Rubber Co., Passaic, N. J., as a research chemist.

Walter F. Brown, general sales manager, United States Rubber Co.'s tire division, and **Herbert D. Smith,** director of automotive sales, have assumed each other's duties as part of the company's management development program. Smith will be responsible for replacement sales of U. S. Royal tires and other automotive products of the tire division; while Brown will take over as director of original-equipment sales of tires, tubes, and air springs to the automotive industry. Smith will move from Detroit to the New York headquarters of the company. Brown will make his offices in Detroit, Mich.

John G. Armistead, manager of the Montague, Mich., Works, E. I. du Pont Nemours & Co., Inc., has been transferred to the company's elastomer chemicals department, Wilmington, Del. Armistead, who will be on special assignment in the department's manufacturing division, will be succeeded by **Harry B. Eaton,** assistant manager of the company's Louisville neoprene works. Also, **John C. Weyrich,** assistant works manager at Montague, will be transferred to Wilmington as manager of the group supervising the new neoprene plant now under construction at Londonderry, North Ireland. All appointments became effective on January 1.

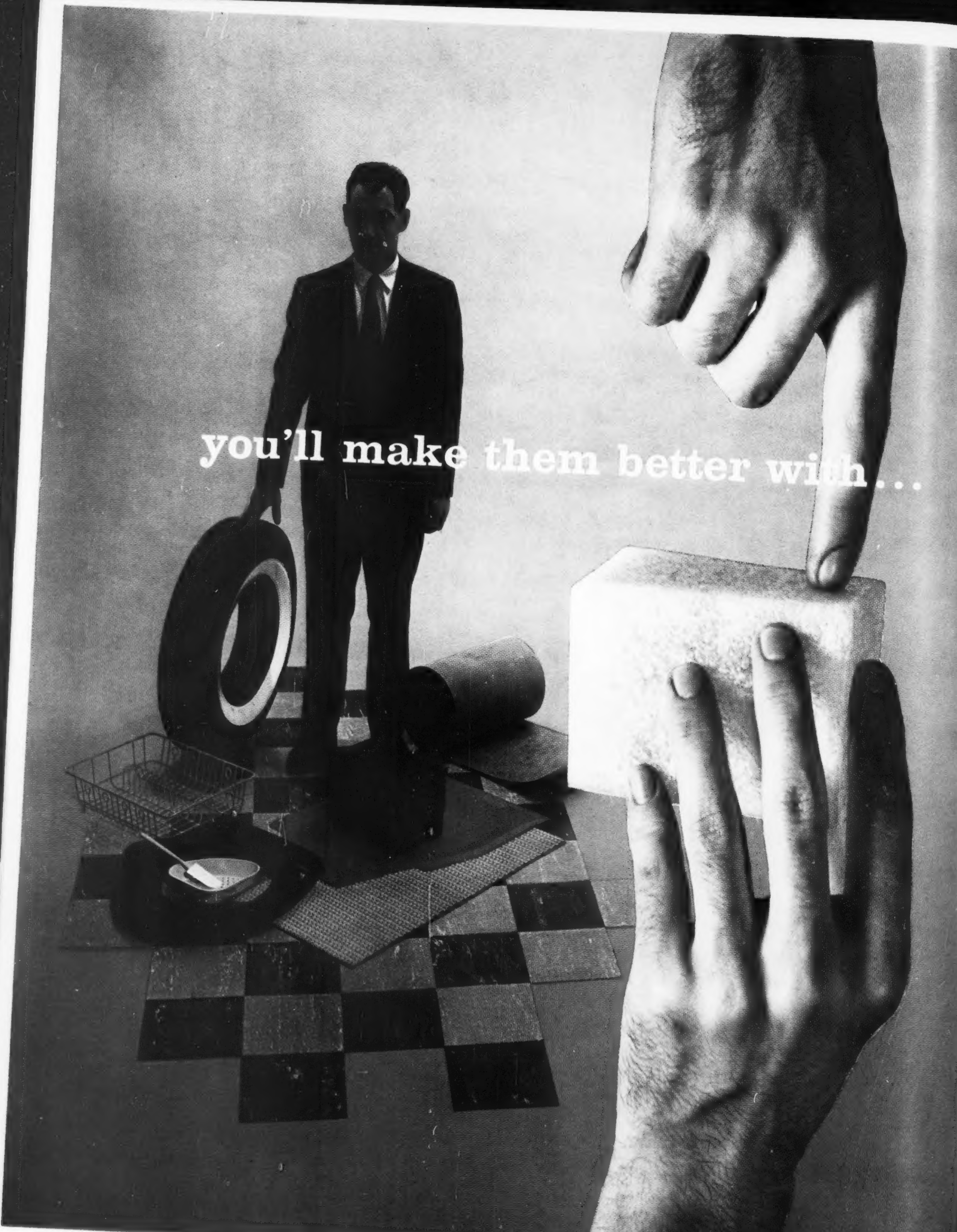
Howard Irvin and **Joseph Showalter** have been elected vice presidents for Marbon Chemical Division of Borg-Warner Corp., Washington, W. Va. Also, former secretary-treasurer **O. Meyer** has been reelected treasurer, while **Miss Rhoda Stewart** becomes secretary. Other officers of the company reelected are **Fred M. Stefan,** executive vice president, and **D. M. Pratt,** vice president.

William J. Sparks, co-developer of butyl rubber, who is a scientific advisor of the Esso Research & Engineering Co., Linden, N. J., has been elected a director-at-large of the American Chemical Society, Washington, D. C. Chosen by the Society's council for a four-year term on the board of directors, he took office on January 1, succeeding **Charles L. Thomas,** director of research and development of Sun Oil Co., Marcus Hook, Pa.

William A. Angus

William A. Angus has joined Rubber & Asbestos Corp., manufacturer of industrial adhesives, Bloomfield, N. J., as vice president, sales, a newly established position in the company's marketing structure brought about by the rapid expansion of its national field sales staff. He has been associated with the plastics and adhesives industries for more than 12 years, most recently as head of his own organization representing manufacturers in the fields of compounded products and electronic components.

Fred A. Weymouth was designated a vice president of Interchemical Corp., New York, N. Y., effective January 1. His new duties include responsibilities for production, plant, and purchasing. Formerly division vice president of the company's printing ink division, Weymouth has been associated with Interchemical for 29 years.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William T. Kellerman has been appointed field engineer for Natural Rubber Bureau Road Research Laboratory, Rosslyn, Va. He previously headed up the Bituminous Sub-Unit for the D. C. Highway Department. He will be available for consultation with state engineers interested in discussing the use of natural rubber and asphalt for surface treatment work.

Lester D. Berger, Jr., has been appointed assistant manager of the new chemicals group of Union Carbide Chemicals Co., New York, N. Y. He will be responsible for the major development of water-soluble chemicals and surface-active agents and will be assisted by two product managers. **Sebern G. Sellers** will be manager for Polyox water-soluble resins and Cellosize hydrozyethyl cellulose; while **Eugene P. Fisler, Jr.,** will be manager for Tergitol surfactants.

William E. Thomas

William E. Thomas has been appointed assistant to the vice president of operations, United Engineering & Foundry Co., Pittsburgh, Pa. He started at the company's Youngstown, O., plant in 1940 and in 1955 was transferred to the Pittsburgh office as manufacturing assistant, which position he held until the present.

Samuel D. Morgan has been made sales manager of Goodrich-Gulf Chemicals, Inc., Cleveland, O. He became comptroller-treasurer of Hycar Chemical Co., a BFG synthetic rubber affiliate, in 1944. In 1946 he accepted a position with the government with whom he remained until he became associated with Goodrich-Gulf in 1955. **Guthery W. Drake** has been named to Morgan's former assignment as manager of sales operations, directing production scheduling activities, marketing research, and sales analysis.

Robert P. Whipple has been named head of the mechanical division of the patent law department of The Firestone Tire & Rubber Co., Akron, O. A graduate chemist and lawyer, he has served as a patent attorney for Firestone for the past seven years. He joined the company in 1946 as a chemist in the analytical laboratory. In 1947 he was transferred to the tire compounding division of the tire development department and remained there until assigned to the law department in 1951.

Leonard F. Pinto has been named manager for rubber chemicals of the Newport Industries Division, Heyden Newport Chemical Corp., New York, N. Y. He has been on the division's technical sales service staff since 1947. Prior to joining Newport, he was associated with Benjamin T. Brooks as a consultant and with the research laboratories of Ludwig Rosenstein. Newport Industries has embarked on an expanded research program for the development of new emulsifiers, tackifiers, antioxidants, accelerators, retarders, and other specialties for both polymerization and compounding of rubber.

William E. Dugan, partner in the private banking firm of Laidlaw & Co., New York, N. Y., has been elected to the board of directors of Rubbermaid Inc., Wooster, O., maker of nationally distributed houseware, automotive, and marine products.

Charles L. Martin, president of Martin Co., New York, N. Y., has left his own company to join the permanent sales organization of Rubbermaid Inc., a company he helped to build as one of the first manufacturer's representatives for the housewares and automotive accessories firm. The announcement was made by **Forrest B. Shaw,** president of Rubbermaid, Wooster, O. Rubbermaid's New York offices at 200 Fifth Ave. are now being remodeled and expanded to include a large showroom area where all the company's displays, housewares, automotive, and marine accessories, will be on exhibit.

Howard E. Elden, senior vice president, manufacturing and technical development, Dunlop Tire & Rubber Co., Buffalo, N. Y., has retired. The announcement, made by **J. Michael Billane,** president, also stated that **Robert A. Burgoyne,** vice president, will assume direction of the technical division in addition to his other duties. Retiring after 36 years of continuous years of management functions with Dunlop, Mr. Elden will not participate in day-to-day operations of Dunlop, but will continue as a consultant and as a liaison officer within the Dunlop international organization.

Robert P. Whipple

Howard E. Elden

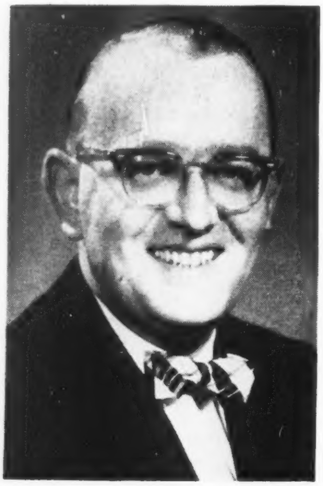
Luedeke Studio

Robert A. Burgoyne

News about People

Glenn W. Poorman, Esso Standard Oil Co. vice president, has been elected a vice president, director, and member of the executive committee of Esso Export Corp., New York, N. Y. Esso Export engages in international supply and marketing operations of the Jersey Standard group of companies. **Thomas W. Moore,** vice president of Esso Export, succeeds Poorman as a vice president and director of Esso Standard, principal domestic refining and marketing affiliate of the Jersey company.

Joseph W. Lockhart has been named manager of company facilities, a newly created post, for the U. S. tires division of United States Rubber Co., New York, N. Y. Lockhart, formerly manager of the Fort Wayne division of Western Auto Supply Co., will be responsible for the operation of retail and wholesale sales outlets for U. S. Royal tires and tire services.



Howard K. Lambert

Howard K. Lambert becomes general sales manager of the machine division of Hobbs Mfg. Co., Worcester, Mass. He will head up the expanding Hobbs sales organization for his division. Representation has recently been added in Louisville, St. Louis, Kansas City, Mo., and Milwaukee, and other representation or new branch offices in major cities are at the implementation stage. Also, **Larry Damour,** who has hitherto served as plant sales engineer at the company's headquarters in Worcester, will succeed Lambert to the post of district sales manager at Cleveland, O.

M. F. Anderson, general manager of Naugatuck Chemical and Latex and Reclaim divisions, has been appointed executive vice president and elected a director of Dominion Rubber Co., Ltd., Montreal, P.Q., Canada. Announcement was made by **C. C. Thackray,** company president.

T. F. Cooke has been named commercial development manager for the organic chemicals division, American Cyanamid Co., New York, N. Y. Dr. Cooke will be responsible for coordinating technical service, market research and market development functions of Cyanamid dye, textile chemical, explosives and mining chemical, rubber chemical, intermediate and petrochemical products. He joined Cyanamid in 1940 as a research chemist.

James M. Church, professor of chemical engineering at Columbia University, has been elected chairman of the American Chemical Society's Division of Industrial & Engineering Chemistry. Dr. Church joined Columbia in 1940 as assistant professor of chemical engineering. He was named associate professor in 1946 and full professor in 1953. A member of ACS since 1934, he is a representative of the Industrial & Engineering Chemistry Division to the ACS council and is a former chairman of the Division's chemical processes unit. He is also a member of the American Institute of Chemical Engineers and the Society of Plastics Engineers.

Charles D. Sturgeon, formerly traffic manager of the Square D Co., Milwaukee, Wis., has been named general traffic manager of The B. F. Goodrich Co., Akron, O., succeeding **Kermit R. Sadler,** retired.

L. J. Campbell, vice president, The Firestone Tire & Rubber Co., Akron, O., has announced four top-level appointments in the Firestone Steel Products Co. **Walter S. Kidder** becomes general sales manager. **W. H. Vaughn,** formerly manager of the company's Wyandotte plant, is now Detroit, Mich., sales manager, while **C. C. Cupp** becomes manager of rim and wheel sales, with headquarters in Akron. **James B. Call,** former production manager of the Akron steel products plant, has been appointed administrative assistant to Kidder.

E. J. Buckler has been named vice president, research and development, Polymer Corp., Ltd., Sarnia, Ont., Canada. Dr. Buckler has been manager of the company's research and development division since 1947. He received his degrees of M.A. and Ph.D. at the University of Cambridge, England. Much of Polymer's successful establishment in commercial competition can be attributed to its vigorous and far-sighted research program managed by Dr. Buckler. His appointment recognizes the contributions made by Buckler and his staff to the company's record of growth and the important role to be played by research and development in its future.

T. F. Cooke

Walter S. Kidder

E. J. Buckler

News about People

Paul G. Carpenter has been named acting general manager of Copolymer Rubber & Chemical Corp., Baton Rouge, La., and is assuming the administrative and operational direction of the plant. Dr. Carpenter has been vice president in charge of research and development since 1956.

James S. Reid, Jr., has been promoted to the post of manager of The Standard Products Co.'s West Coast division at Fullerton, Calif. **Charles T. Gue** succeeds Reid as the company's director of industrial relations in Cleveland, O.

E. W. Shaw is now purchasing agent at the B. F. Goodrich Co.'s Los Angeles, Calif., plant, replacing **Larry Finley,** who has been transferred to Goodrich's Akron, O., plant to take over the duties of **A. D. MacPherson.**

Raymond H. Perkins

Raymond H. Perkins becomes West Coast manager of Farrel-Birmingham Co., Inc., with offices at 2032 Santa Fe Ave., Los Angeles 21, Calif. He succeeds **Paul R. Oliver,** who retired December 31 after having served as manager for the past 10 years. Perkins had been assistant West Coast manager since 1954.

Herbert Hoover, Jr., has been elected a director of Monsanto Chemical Co., St. Louis, Mo. Hoover, a consulting engineer, served as Under Secretary of State from 1954 to 1957 and is the son of the 31st President of the United States.

J. H. Paden has been named director of research for the organic chemicals division, American Cyanamid Co., making his headquarters at the company's laboratories in Bound Brook, N. J.

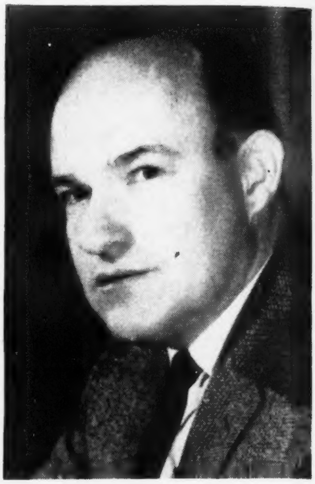
Thomas B. Nantz has been named vice president of manufacturing for B. F. Goodrich Chemical Co., Cleveland, O. He joined The B. F. Goodrich Co. as a chemist in 1937. In 1943 he went to BFG's Louisville, Ky., general-purpose synthetic rubber plant and later became production manager. In 1947 he became production manager of BFG Chemical's nitrile rubber plant at Louisville. He was given the assignment, as plant manager, of reactivating the huge government-owned rubber facility at Institute, W. Va., in 1950. Nantz was named plant manager of the new vinyl monomer plant of BFG Chemical in Calvert City, Ky., in 1952, and later his responsibilities there included the newly constructed acrylonitrile plant. He was appointed general manager of plants and assigned to the Cleveland, O., main office in August, 1955.

David C. Hawk has been appointed manager of technical service, Cary Chemicals, Inc., New Brunswick, N. J. He was formerly chief chemist with The Ansonia Wire & Cable Co., Ashton, R. I. Hawk is well qualified for the position he will hold with Cary, producer of polyvinyl chloride resins and compounds.

R. Tesoro has been named assistant plant manager, operations, and **R. H. Darling,** assistant plant manager, engineering, construction, and maintenance, as part of Jefferson Chemical Co.'s current expansion program at Port Neches, Tex. They will report to **M. H. Holmes,** plant manager. Other moves involve **E. R. Cobb,** who replaces Tesoro as chief processing engineer, and **C. H. Moore,** who succeeds Darling as chief engineer, engineering and maintenance division. These moves are designed to gear the organization to the needs of its rapidly expanding facilities. The company recently announced the completion of a new ethylene unit, and other units soon to be completed include an ethylene oxide plant and a chlorine-caustic plant.

Fred T. Koyle and **Maurice Rappaport** recently were appointed vice presidents of H. A. Astlett & Co., Inc., New York, N. Y. dealer in natural rubber.

Paul Taylor, supervisor of mechanical development at the Gates Rubber Co., Denver, Colo., has been made chief engineer of the company. He will have management responsibility for machine and building design, maintenance, and building and machine development. Departments under his direction will include engineering, guards, and nine different engineering shops. He previously was with The B. F. Goodrich Co., Ohio Rubber Co., and Mansfield Tire & Rubber Co.



Thomas B. Nantz

David C. Hawk

Paul Taylor

News about People

Ralph M. Knight has been appointed manager of polyolefin planning and applications for U. S. Industrial Chemicals Co., Division of National Distillers & Chemical Corp. New York, N. Y. He will be responsible for the long-range planning and coordination of U.S.I.'s polymer development program. He will also direct the company's polymer service laboratories at Tuscola, Ill.

Garret B. James, Jr., was recently appointed technical sales engineer for the nuclear products division, American Latex Products Corp., Hawthorne, Calif. With headquarters at the new Freedlander Research & Development Center at Hawthorne, he will travel throughout the United States assisting government and commercial manufacturers in the varied applications of the versatile Stafoam polyurethane materials.

Garret B. James, Jr.

Daniel W. Klohs becomes a technical sales representative for the vinyl additive division of the Nuodex Products Co., division of Heyden Newport Chemical Corp., Elizabeth, N. J. He will be concerned with sales and technical service for the complete line of Nuodex vinyl additives to the vinyl processing industry. Klohs previously had been chief chemist at Pioneer Latex & Chemical Corp., Middlesex, N. J.

Herman F. Mark, world authority on the chemistry of wood, fibers, plastics, and rubber, and director of the Polymer Research Institute of the Polytechnic Institute of Brooklyn, has been elected chairman of the American Chemical Society's Division of Cellulose Chemistry for 1959. He succeeeds **Leo B. Genung,** of Eastman Kodak Co., Rochester, N. Y. Dr. Mark also is a professor of organic chemistry at Brooklyn Poly.

Hans Stauffer has been elected a director of Columbian Carbon Co., New York, N. Y., it was announced by **L. L. Shepard,** president. Mr. Stauffer is president of Stauffer Chemical Co., New York, and is a director of Montrose Chemical Corp. of California, Old Hickory Chemical Co., Philadelphia Quartz Co. of California, Western Phosphates, Inc., Cornwall Chemicals, Ltd., Industries Quimicas de Mexico, S. A., and Greyhound Corp. He is also a director of the Manufacturing Chemist's Association and a trustee of the National Conference Board.

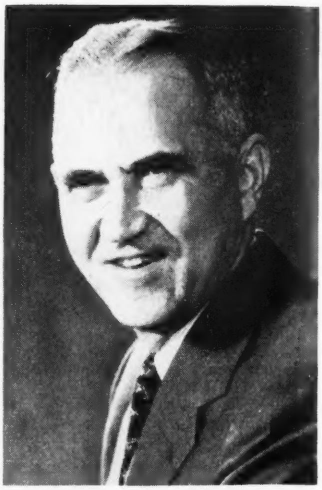
Robert M. Roach has been made regional manager, Midwest region; **Kenneth L. VanderVoort,** district manager, northeastern district; and **Clifford K. Beckman,** district manager, Midwest district, by Jefferson Chemical Co., Inc., New York, N. Y. Mr. Roach joined Jefferson in 1953 as a salesman and was appointed northeastern district manager in 1957. He replaces **Ralph E. Werley,** who has been moved to Houston, Tex., as sales manager of the company. VanderVoort started with Jefferson in 1952 and has been Midwest district manager. He will now make his office in New York. Beckman, on the sales force since 1954, will be stationed in the Chicago, Ill., office, as will Roach.

Richard E. Drady has been appointed purchasing agent of the heel and sole division of American Biltrite Rubber Co., Chelsea, Mass. His office is at 22 Willow St., Chelsea 50, Mass.

S. M. Main has been appointed to the new office of product manager of the merchandise division, Scovill Mfg. Co., Waterbury, Conn. He was a sales manager of the division since 1938, having joined the company in 1917. **Rae M. Broker,** former assistant sales manager, has been named sales manager of the industrial couplings section of the division. He has been with the company since 1951. Also, **James A. Bayard** has been put in charge of advertising.

Edward B. Reynolds has joined the staff of the American Management Association, New York, N. Y., as marketing division manager. He had been with United States Rubber Co. since 1954, serving most recently as product line and pricing manager for U. S. passenger tires.

J. Donald Burvee and **R. M. Wilson** have been appointed sales representatives for Pioneer Rubber Co. of Texas, Willard, O., in the industrial products division. Burvee will cover the states of Missouri, Kansas, Oklahoma, Wyoming, and Colorado from Kansas City, Mo., and Wilson will represent them in Texas and New Mexico.



Hans Stauffer

S. M. Main

Rae M. Broker

News about People

E. K. Hunt has been named to the newly created post of merchandising manager, and **H. C. Milton** has been appointed to succeed him as sales manager of the plastics and resins division, American Cyanamid Co., New York, N. Y.

Judson S. Bryant has been appointed controller, international operations, for Borden Chemical Co., New York, N. Y. He will be responsible for coordination and control of accounting, tax, and financial matters of the chemical division's foreign subsidiaries, and export operations.

Stanley Meyers has been named purchasing agent for the United States Rubber Co.'s Los Angeles, Calif., plant.

Harry C. McCreary, president, McCreary Tire & Rubber Co., Indiana, Pa., left January 16, 1959, for a six-month tour of Europe. Accompanied by his wife, Mr. McCreary plans to inspect 17 tire manufacturing plants in nine European countries during his trip. Purpose of the trip is to see first-hand some of the developments being pioneered in some of these modern foreign plants.

J. D. Ferguson has been named sales manager for Dominion Royal Tires. Ferguson, who joined the tire division of Dominion Rubber Co., Ltd., Montreal, P.Q., Canada, in 1946, will direct sales activities of Dominion brand tires through its branch and distributor organization across Canada. **L. T. Vauthier** has been made sales manager, special accounts, and will also handle special assignments for the company. Both Ferguson and Vauthier will continue to headquarter at the executive offices of the tire division in Kitchener, Ont.

William O. Blandford has been named assistant to the merchandising manager of the mechanical goods division, The Dayton Rubber Co., Dayton, O. He will handle new product development and promotion under the direction of **L. J. Adams,** merchandising manager.

James B. Fisk, executive vice president of Bell Telephone Laboratories, New York, N. Y., was elected president of the company, effective January 1. He succeeds **Mervin J. Kelly,** who was elected chairman of the board of directors. Dr. Kelly has served as president of the Laboratories since 1951. **Estill I. Green,** vice president in charge of systems engineering, was named executive vice president, also effective January 1. Dr. Fisk has been associated with Bell Laboratories for nearly 20 years.

Norman R. Cox, Robert G. Kelso, and **Fred W. Stone** have been appointed group leaders in the development department of Union Carbide Chemicals Co., division of Union Carbide Corp., South Charleston, W. Va. Cox will work on process development on a pilot-plant scale; Kelso and Stone will work on process and product development.

R. E. Werley, Jr., has been appointed sales manager of Jefferson Chemical Co., Inc., New York, N. Y., effective January 1. Also, **David B. Peery** becomes salesman, eastern region, and **Allen M. Brandt** becomes a technical service man in Houston, Tex. Werley was the company's Midwest regional manager, with headquarters in Chicago, Ill., since 1956. Peery, prior to joining Jefferson, had been in technical service and development for The Dow Chemical Co. Brandt was previously with Shell Oil Co. in its marketing department.

Thomas B. Applewhite has been appointed assistant manager of conveyor products sales, United States Rubber Co. Headquartered in the Passaic, N. J., plant, manufacturing and sales center for conveyor products, he will be in charge of technical and training fuctions in the conveyor belt department. He previously had been with the rubber company's mechanical goods division.

Harry C. Wechsler was made a vice president of Borden Chemical Co., New York, N. Y., effective January 1. He now is responsible for development of various plastic projects and also retains his responsibilities as general manager of Borden's polyvinyl chloride department, headquartered in Leominster, Mass.

Norman W. Smith has been appointed production manager of the mechanical goods division of Dominion Rubber Co., Ltd., Montreal, P.Q., Canada. He joined Dominion in 1939 and became factory manager of the Latex and Reclaim division in 1944, the position he held until assuming his new duties. **Albert Beauchamp,** factory superintendent of this latter division, becomes factory manager, succeeding Smith.

J. T. Morrow, additive salesman, Enjay Co., Inc., New York, N. Y., has been placed in charge of Enjay's new Toronto office, which will function as part of the operations of the export division and will give direct service to Enjay's Canadian customers for additives. Morrow joined Enjay in 1955 as a salesman in the Paramins division, became sales supervisor of the eastern sales division in 1957, and transferred to the export division in August, 1958.

Carl M. Allen, Oscar Crispens, and **Raymond H. Walcott** have retired from Stauffer Chemical Co. Allen was plant manager of the Stauffer plant at Bentonville, Va., and has been with the company since 1939. Crispens, sales promotion coordinator, industrial chemicals division, joined the company in 1926. Previously he had been associated with a distributor of Stauffer products so that his relation with Stauffer has spanned 50 years. Walcott, technical administrator, agricultural chemicals division, joined the company in 1924 and is a recognized authority on sulfur and its uses.

David S. Walker, controller, The Richardson Co., Melrose Park, Ill., has been elected to membership in the Controllers Institute of America, New York, N. Y.

Obituaries

James I. Simpson

James I. Simpson, chairman of the board of directors of Dunlop Canada, Ltd., Toronto, Canada, passed away on November 14, 1958, after a short illness, at the age of 73. After experience in the banking business, and with Canadian Industries, Ltd., Mr. Simpson became general manager of Dunlop in Toronto in 1932, vice president and general manager in 1933, and was elected president in 1939. He has been chairman of the board since 1953.

Mr. Simpson served many years on the board of directors of the Rubber Association of Canada, and also served a term of office as president of the Association during World War II.

Arthur J. Kraft

Arthur J. Kraft, who covered the chemical and rubber news in Washington for the New York *Journal of Commerce* and RUBBER WORLD from 1949 to 1956, and for McGraw-Hill's *Chemical Week* from 1956 on, died Christmas Day at the Washington Hospital Center, Washington, D. C., after a long illness, at the age of 35.

"Art" Kraft, as he was known to his friends and associates of the Fourth Estate and to his many friends and associates in the chemical and the rubber industry, was graduated from the University of Michigan in 1944. He worked on the *Pontiac, Mich., Daily* until joining the *Journal of Commerce* in New York in 1947. He was transferred to its Washington Bureau in

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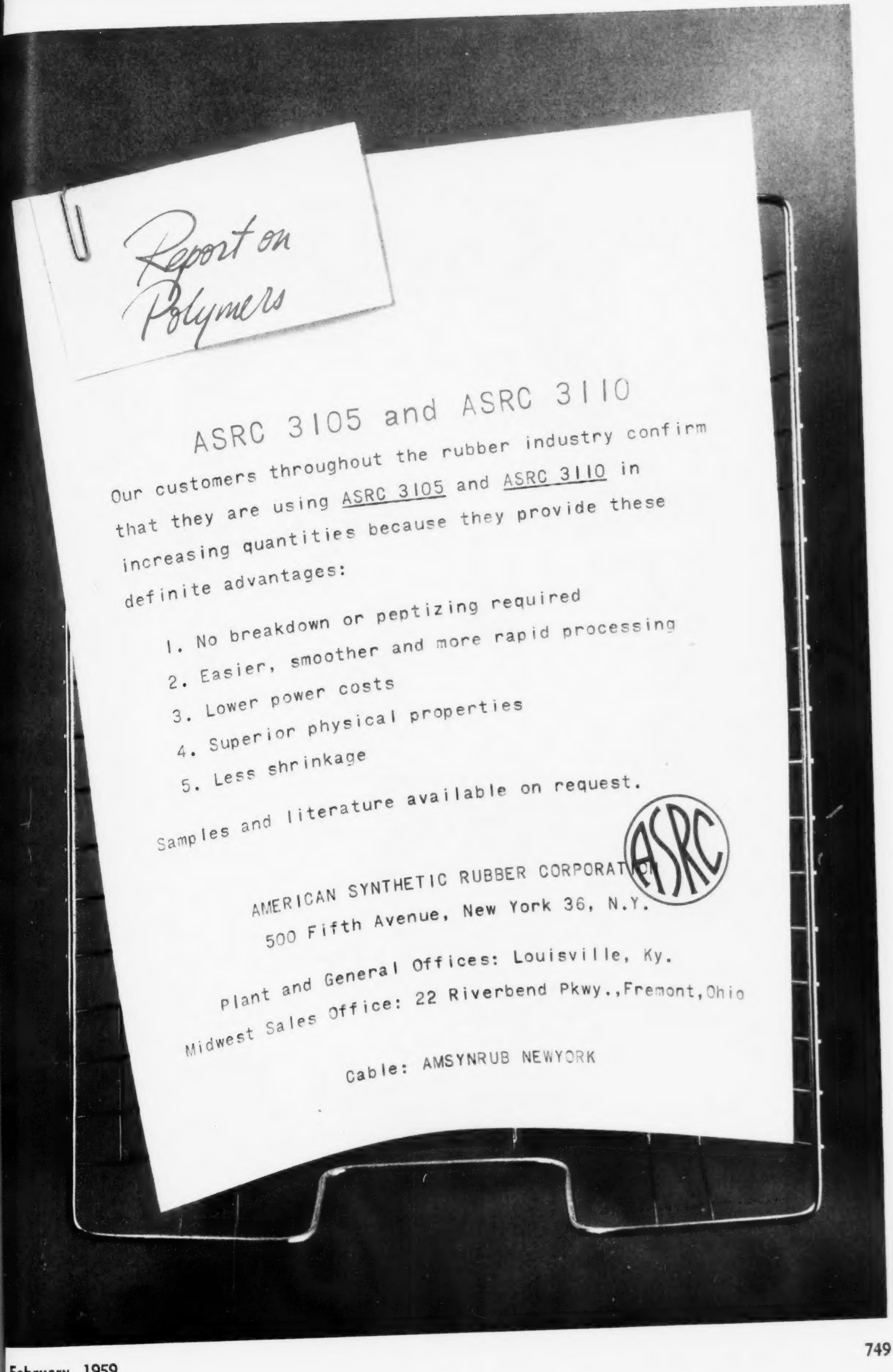
Report on Polymers
ASRC 3105 and ASRC 3110
Our customers throughout the rubber industry confirm that they are using ASRC 3105 and ASRC 3110 in increasing quantities because they provide these definite advantages:
1. No breakdown or peptizing required
2. Easier, smoother and more rapid processing
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Obituaries

1949 and at that time also began writing a monthly "Washington Report" column for RUBBER WORLD. His writing on rubber for both the *Journal of Commerce* and RUBBER WORLD earned him the reputation as one of the country's leading press experts on rubber. He joined *Chemical Week* three years ago.

He was a member of the Washington Rubber Group and helped that organization start its publication. "Capital Cues," in fact was responsible for its name.

He is survived by a wife and a son.

George P. MacFarlan

George P. MacFarlan, since 1954 assistant manager of automotive jobber sales for Goodyear Tire & Rubber Co.'s industrial products division, Akron, O., died suddenly at his home in North Canton, O., on December 20.

He attended Kent State University and was a teacher until he entered the sales field in 1936. He joined Goodyear in 1954 as a special representative for automotive jobber sales.

The deceased was born in Adena, O., 55 years ago.

Mr. MacFarlan was a member of Zion Evangelical & Reformed Church and Masonic organizations.

CALENDAR of COMING EVENTS

March 3
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.
Buffalo Rubber Group. Hotel Westbrook, Buffalo, N. Y.

March 10
Ontario Rubber Group, CIC. Guelph, Ont., Canada

March 12
Northern California Rubber Group.

March 13
Chicago Rubber Group. Furniture Club, Chicago, Ill.

March 16-18
Society of Automotive Engineers. National Passenger Car, Body, and Materials Meeting. Sheraton-Cadillac, Detroit, Mich.

March 19
Quebec Rubber & Plastics Group.

March 20
New York Rubber Group. Henry Hudson Hotel, New York, N. Y.
Boston Rubber Group.

March 30-April 1
American Physical Society. Cambridge, Mass.

March 31-April 2
Division of High-Polymer Physics, APS. Cambridge, Mass.

April 3
Akron Rubber Group. Sheraton Hotel, Akron, O.

April 6
Washington Rubber Group.

April 6-7
Division of Polymer Chemistry, ACS. Boston, Mass.

April 7
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

April 16
Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.

April 17
Detroit Rubber & Plastics Group, Inc. Detroit Leland Hotel, Detroit, Mich.

April 24
Chicago Rubber Group. Furniture Club, Chicago, Ill.

May 1
Buffalo Rubber Group and Ontario Rubber Group, CIC. Joint International Meeting. Hotel Sheraton-Brock, Niagara Falls, Ont., Canada.
Division of Rubber Chemistry, Chemical Institute of Canada. Annual Convention. Hotel Sheraton-Brock, Niagara Falls, Ont., Canada.
Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.

May 4
Washington Rubber Group.

May 12-15
Division of Rubber Chemistry, American Chemical Society. Biltmore Hotel, Los Angeles, Calif.

May 22
Connecticut Rubber Group.

May 25-27
Chemical Institute of Canada. Forty-Second Annual Convention. Halifax, Nova Scotia, Canada.

June 4
New York Rubber Group. Outing. Doerr's Grove, Milburn, N. J.

June 5
Fort Wayne Rubber & Plastics Group. Outing.
Quebec Rubber & Plastics Group. Outing.

June 9
Buffalo Rubber Group. Golf Outing. Lancaster Country Club, Buffalo, N. Y.

June 12-14
Rhode Island Rubber Club. Twenty-Fifth Anniversary Outing. The Belmont, West Harwich, Cape Cod, Mass.
Southern Rubber Group. Desert Ranch, St. Petersburg, Fla.

June 15-19
American Society of Engineering Education. Pittsburgh, Pa.

June 19
Akron Rubber Group. Outing. Firestone Country Club.

June 22-26
American Society for Testing Materials. Annual Meeting. Atlantic City, N. J.

June 26
Detroit Rubber & Plastics Group, Inc. Outing. Western Golf & Country Club.

August 6
New York Rubber Group. Golf Tournament.

September 12
Conecticut Rubber Group. Outing.

September 24
Fort Wayne Rubber & Plastics Group.

October 13
Buffalo Rubber Group.

October 23
Akron Rubber Group. Sheraton Hotel, Akron, O.

NEWS from ABROAD

The Research Association Of British Rubber Manufacturers

By J. R. SCOTT and W. F. WATSON

The retirement of Dr. J. R. Scott and the appointment of Dr. W. F. Watson as director of the Research Association of British Rubber Manufacturers make it timely to review for our readers the organization and functions of the Research Association. Accordingly, we have asked Drs. Scott and Watson to describe the Association, and we print their reply below.

In the dark days of 1916, the British Government started planning for a future which it appreciated to be based materially on technology by creating a Department of Scientific & Industrial Research. The DSIR has developed into an important part of British science, directly controlling the national physical and chemical laboratories and its own research stations. The cooperation of the government and industry in setting up research associations was instituted from the beginning, and the first research association was formed in 1918.

The rubber industry took the initiative among the pioneers in registering its research association on October 9, 1919. By June 1, 1921, premises had been purchased in Croydon on the southern outskirts of London. The association showed its vitality by rendering its building quite inadequate in size; the dates of the various extensions at Croydon—1934, 1942, 1944, 1947, and 1948—indicate the autocatalytic progress of the association. These makeshift adjustments finally reached their limit, and new premises were acquired with the truly English address of Shawbury, Shrewsbury, Shropshire, and were formally opened in 1954 by His Royal Highness, Prince Philip, Duke of Edinburgh. The original purpose of the main building was as a workhouse for vagrants, and we hope that the "workhouse" is the part of the description which is still valid. It is curious how the needs of tramps and technologists are met by a building of the same structure; the library archives were the original cubicle sleeping quarters, and aging studies are appropriately carried out in the former mortuary.

RABRM Membership and Finances

The rubber manufacturers' association is made up of voluntary members. "Members" are British firms or individuals or British-based firms of foreign ownership who pay a subscription at an agreed rate (at present £50 plus 10/- per operative annually) and comprise currently firms with 75% of the output of the industry. Membership also includes suppliers of rubbers, rubber chemicals, machinery, and affiliated textile and other firms and individuals with interests in rubber at a rate determined for each application. A number of plastics manufacturers are members, and the Association welcomes an extension of its activities to cover the allied interests of these members as well as of rubber manufacturers themselves.

The members elect a RABRM council to direct the activities of the Research Association and to deal with administrative problems emanating from it. The present chairman is D. B. Collett, of Dunlop, and the president is P. W. Howard, of B.T.R. Industries.

Since the Association's inception, the government has subscribed about one-third of the cost of RABRM and does so now provided the industry supplies a minimum amount which DSIR considers is at least reasonable and sufficient evidence of the support of the industry. The government also grants tax relief on industry's contribution. For the period ending in 1958, the industry met the requirement of £50,000 to receive a government grant of £25,000. The insuring of finances for five-year periods provides security and stability for the Association to carry out long-term plans.

(Relations with the British Rubber Producers' Research Association are very cordial, but in their finance and structure, the two associations are quite separate. The BRPRA laboratories are financed largely from Malaya without the support of the British Government to conduct research on natural rubber.)

Organization and Work

The first director of research at RABRM was B. D. Porritt, who held office from 1920 to 1940. Dr. Scott succeeded him as director and continued as such until November, 1958. Dr. Watson succeeded Dr. Scott, who will continue as scientific adviser to the Association (a title wide enough to allow for continuity and counsel in the various activities of the Research Association).

Fig. 1. Dr. J. R. Scott *(left)*, who recently retired as director of the RABRM, and Dr. W. F. Watson, who succeeded him as director

The Association is organized into the overlapping division of (1) research, (2) technology, and (3) intelligence, headed by W. C. Wake, C. W. Moakes, and T. H. Messenger, respectively.

It is difficult to summarize here research activities covering 40 years. A topic such as the properties of ebonites has been investigated very thoroughly, if not full-time, from 1929 to 1947 and forms the definitive work on this material. Chemical research on deterioration of rubber containing traces of heavy metals has been pursued intensively for three years, resulting in considerable clarification of the underlying chemistry and means for its retardation. Tests of materials are regularly studied; for example the International Standards Organization (ISO) hardness test now adopted by American Society for Testing Materials (ASTM) is based on RABRM work. Machines for testing purposes have been developed; an improvement on the well-known Roelig dynamic test machine and an automatic, electronically recording, tensometer are recent items. Operational research with special reference to inter-firm comparisons recently was conducted on mastication and mixing and has drawn attention to improved methods which can, and indeed have, boosted efficiency by 50-100% on average; other operations are currently under study.

News from Abroad

Fig. 2. A view of the front of the square of buildings that comprise the laboratories of the RABRM

The technology department evaluates raw materials as they are put on the market. Since 1952, 154 different substances have been investigated, including 42 varieties of synthetic rubber. Technical service and advice to members is also a regular feature. Here the Council authorizes the research staff to be selective and to give priority to materials and problems of general interest. Confidential consultative work may be undertaken at the expense of the individual member.

From its early days under the vigorous direction of T. R. Dawson, the library and intelligence division has been prominent. The library is believed to be the world's most comprehensive on rubber and allied materials. Translations of foreign publications, particularly the mushrooming Russian literature, is carried out for a widening public. The intelligence division has also the formidable task of disseminating the mass of inflowing information as appropriate to managing directors, technical staff, or factory foremen. Members also make considerable use of the division for literature searches on special topics. "Rubber Abstracts"—purchased world-wide by non-members—gives the most general coverage of rubber research, technology, patents, and trade affairs.

A bi-monthly RABRM bulletin is issued to members summarizing information available from RABRM's own work. Despite the amount of written information, however, it is recognized that personal contacts are all-important. Visits to and from Shawbury, Open Days, and lecturers strengthen the links between the Research Association and the industry. It is planned to follow the experimental colloquium held recently at a Country House near Shawbury by many more, at which we hope to have conferees from the U.S.A.

Malaya

Commodity Valorization Scheme

A timely discussion appeared in the *Straits Times*, December 24, of a valorization plan offered by the British economic writer, L. St. Clare Grondona, in a book, "Utilizing World Abundance," which is said to have had a favorable reception among economists in England. It seems that the aim is to stabilize the pound (and ultimately other currencies) by keeping the prices of essential, durable basic commodities, including tin and rubber, at realistic levels, with fluctuations limited "to a prenotified range equitable to producer, trader, and industrial user."

This would be brought about through the agency of a British Price Stabilizing Corp. financed by bonds guaranteed by the British Government, and there would be no political, departmental or other interference or influence. Valorizing indexes would be fixed for each product; also a low point 10% below the index, and a high point 10% above the index. The corporation would buy when the price for a commodity reached the low point, but not as long as the market absorbed all available supplies. Then the price would be allowed to rise from the low to the high point, but by not more than 22.2%, when the corporation would sell, as long as it held stocks. It would only operate when applied to by sellers or buyers and only as a last resort.

Price Stabilization Debated for Rubber

The question of price stabilization for rubber is increasingly occupying the Federation Government. At the Commonwealth Conference held in Montreal last September, Federation Minister of Commerce & Industry, Tan Siew Sin, spoke on the matter stressing the need of aid from the International Monetary Fund to finance a scheme to control price fluctuation in the rubber market. The government also joined other nations in sponsoring a resolution urging measures to solve commodity problems, to be taken by the United Nations.

The subject was again brought forward by the Minister in the Federal Legislative Council, last December, when he stated that it should be possible to devise a practicable, not too ambitious, scheme to moderate excessive price fluctuations for rubber. He felt that the International Monetary Fund should change its rules regarding balance of payment questions so as to be able to help stabilization schemes, since price instability of commodities was very often the source of the balance of payment difficulties; fluctuations affected primary producers, which included most African and Asian countries as well as countries such as Australia and New Zealand.

If the Minister had a definite scheme in mind, he did not make that clear. However it is doubtful whether that would have helped to make the idea of a price stabilization plan more acceptable to rubber men as a whole. It comes too soon after the near-fiasco of the tin-stabilization scheme, brought about by Russian dumping of tin on the world market. The president of the F.M.S. Chamber of Commerce, H. B. Hussey, speaking in the Federal Council, warned the government Russia and China could wreck a rubber scheme as easily and successfully as they wrecked other schemes. They have been buying rubber heavily for a long time; they may be using it, he said but "there is every possibility that they will do the same with rubber as they did with cotton and tin." He stressed that Communist dumping tactics could create a state of economic collapse in those countries that got into their grip.

Mr. Hussey did not forget the 1,250,000 tons of natural rubber held in reserve by the United States, or the stockpile of 200,000-300,000 tons in Britain, and he emphasized that the cooperation of both countries would have to be secured before any stabilization scheme could work.

News from Abroad

New Tire Factory for Malaya?

Japanese tire interests are reportedly planning to invest capital and technical know-how in a $10,000,000 (Straits currency) expansion program proposed by a local rubber manufacturing company, involving the reopening of the Feng Keong Rubber Factory, at Klang. This factory, closed down about three years ago following a strike, formerly specialized in rubber footwear, when it was said to be producing 10,000 pairs a day; it also made 150 tires and the same number of tubes daily. The factory is said to be in good condition, with its $2,000,000 worth of equipment apparently intact.

The plan, however, is to concentrate on tire production, and the former output is to be tripled so that all needs of Malayan consumers could be covered. It is estimated that Malaya requires about 120,000 passenger-car tires and as many tubes, in a year, besides a substantial number of heavy duty tires and tubes. The company has already applied for tariff concession under the Pioneer Industries Bill, the *Malay Mail* learns.

Merger of Four Rubber Plantation Companies

An important merger is being planned involving four rubber planting companies, Sungei Choh Rubber, Golconda Malay Rubber, Seremban Rubber Estates, and Jugra Estate. The first three companies have entered a conditional agreement and a new company, G & H Plantations, has been formed which has made an offer to Jugra Estate to acquire all its issued capital. The group aims at more economic administration and more effective use of combined financial resources, among other considerations. The area owned or controlled would be 14,574 acres.

When negotiations are completed, the capital of the new company is to be raised to £1,500,000; its program will include replanting of old rubber seedling trees with modern high-yielding material and replacing old rubber and coconuts in some areas with oil palms.

Low-Temperature Rubber

The Rubber Research Institute of Malaya has also been working on the problem of producing low-temperature rubber. The BRPRA and the Rubber Stichting, in Holland, had found that the structure of the rubber molecule could be changed, and thus its tendency to crystallization at low temperature considerably reduced by reacting with small quantities of thiol acids. The most

effective method of effecting the modification is by heating suitably stabilized rubber latex with the thiol acid in the presence of a catalyst—a process that has been patented by the British Rubber Producers Research Association.

Because certain non-rubber substances in some latices inhibit reaction, doubly centrifuged latex has been used in semi-commercial preparation in Britain. Recent experiments at the Rubber Research Institute have indicated how the process may be modified to make it work more simply and cheaply with fresh latex. The rubber produced from the coagulated latex is processed by methods which differ but little from those which are used with normal smoked sheet.

Singapore Rubber Price

The table below, giving average Singapore rubber prices over the period 1950-1958, inclusive, published early this year, **clearly shows the wide fluctuations in the rubber market;** values are in Straits dollars.

Year	Cts.
1950	108.18
1951	169.55
1952	96.97
1953	67.44
1954	67.30
1955	144.16
1956	96.76
1957	88.75
1958	80.15

It will be seen that the 1958 average was the lowest since 1954. The lowest closing price last year was 71¼ cents on May 7; almost exactly six months later, on November 12, the highest price for the year, 92¾ cents was reached.

Indonesia

Latex Research Results Reported

The July, 1958, issue of *Archives of Rubber Cultivation* contains four papers received for publication from March, 1957, to January, 1958, inclusive. In the first of these, Tan Hong Tong discusses tapping experiments carried out by J. T. Schmole at the Polonia Gardens of the A.V.R.O.S. Experiment Station, Sumatra, in the 1930's. Polonia has meantime been abandoned, and the present paper elaborates data on results of experiments to 1941.

The aging of rubber sheet made from latex obtained from trees treated with yield stimulants was the subject of the investigation reported on by Lauw Ing Koen. A simple method for accelerating the aging of samples was used in this work, involving the homogenization of the rubber and subsequently heating at 140° C. for 30 minutes. Mooney viscosity was then determined; the difference between average Mooney viscosity

of treated and untreated samples constituted the measure of stability, with decrease in viscosity of less than 30 Mooney points being considered normal. It is shown that no samples of trees treated with stimulants, either on a certain estate or at the Experiment Station at Bogor, underwent a decrease in Mooney viscosity of more than 30 points, so that it is concluded that the results of the experiments give no indication that resistance to aging of the rubber was impaired because of the use of stimulants.

W. L. Resing studied the preservation of *Hevea* latex with ammonia and 2-4-6-tri- (dimethylaminomethyl) phenol.[1] The product, tested in small amounts for the short-time preservation of field latex, did not prove satisfactory, but it effectively preserved concentrated latex when used in concentrations of 0.35-0.25% together with 0.15-0.25% ammonia. Latex so treated had pH of 9.5-10, and vulcanized films showed good mechanical properties. No special difficulties were encountered in the production of foam rubber from this latex if the amounts of zinc oxide and sodium silicofluoride used for gelation of the foam were properly adjusted. The drawback in using DMP-30 seems to be that the latices show more pronounced thickening in presence of ZnO than latices prepared with ammonia alone or with amonia+Santobrite.[2]

The solubility of ZnO in *Hevea* latex and its relation to the composition of the latex was the subject of the last paper, also by W. L. Resing. A first step in the destabilization (thickening) of compounded latex is the solubilization of ZnO in the serum. It has been indicated (Van den Tempel) that ZnO solubility in latex depends mainly on the ammonia content and the pH of the latex and that the solubility S can be expressed as:

$$S = f' \sqrt{(NH_3)\ (NH_4^+)}.$$

There seems to be no simple relation, however, between ZnO solubility and $\sqrt{(NH_3)\ (NH_4^+)}$ when a number of latices of different age and origin are compared. Determination of the ZnO solubility in different types of latices revealed very large differences, even at comparable $\sqrt{(NH_3)\ (NH_4^+)}$ values.

From a study of model solutions, by addition of ammonium salts to latex and treating latex with trypsin, evidence was obtained that variations in phosphate content and protein breakdown products are responsible for anomalous values of zinc oxide solubility.

[1] DMP-30, Rohm & Haas Co., Philadelphia, Pa.

[2] Sodium pentachlorophenate, Monsanto Chemical Co., St. Louis, Mo.

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NEW MATERIALS

Niax Catalyst D-22 for Polyether Foams

Niax Catalyst D-22, a new catalyst for the manufacture of polyether urethane foams, is now available from Union Carbide Chemicals Co., a division of Union Carbide Corp., South Charleston, W. Va. It is said to be many times more active than fast amine catalysts; consequently, it has been possible to effect a one-step conversion of polyethers to polyether urethane foams. Usually, polyether-based foams have required a two-step or prepolymer process because of the relative slowness of the urethane chain extension step when using polyether diols or triols. The use of Niax D-22, a dibutyl tin dilaurate, is said to eliminate this problem.

Some typical physical properties and specifications of Niax D-22 are reported as follows:

Appearance and color	pale yellow liquid max. color 6 Gardner
Specific gravity, 25/25° C.	1.03–1.06
Tin content	min. 18% by weight, max. 19.2%
Chloride content	not more than 0.5% by weight, calculated as NaCl
Specific gravity, 20/20° C.	1.066
Weight per gallon 20° C.	8.87 lbs.
Flash point, open cup	440° F.
Viscosity, 20° C.	45.3 cps.
Refractive index n_D^{20}	1.4680
Freezing point, °C	8
Solubility in water	insoluble

A technical bulletin, F-40457, giving detailed information on Niax Catalyst D-22, is available from the company.

Flexible Rubber Paint

A new flexible rubber paint suitable for use on the surface of rubber articles has been announced by Vansul Colors Co., Englewood, N. J., formerly known as Vansul Sales Co. The new product, called Vanflex Colored Finishes, is a paint with Du Pont's Hypalon as the base.

Vanflex is furnished in concentrated form and is diluted with one of three grades of solvent obtainable from the company according to the method of application. Colors available include orange, two reds, blue, two greens, yellow, aluminum, clear, black, and white. The material may be applied by silk screen, spray, brush, and dip or roller. A liquid vulcanizing agent is furnished for films requiring exceptional ozone resistance, but is not normally recommended for general use.

Bulletin 14-1158 describing methods of application, kinds and quantities of solvents for dilution, and steps for preparing the surface, as well as prices, containers, and deliveries is available from the company to anyone interested.

New Durez 19428 Resin

Durez 19428, a heat-reactive phenolic resin for use principally in neoprene cements, is now available in commercial quantities from the Durez Plastics Division, Hooker Chemical Corp., North Tonawanda, N. Y. The addition of such a phenolic resin to neoprene cement formulations results in better adhesion to Dacron, nylon, rayon, glass, metals, and unplasticized plastic films. It also minimizes the tendency of bonded fabrics to deteriorate in sunlight.

Since it is heat-reactive, Durez 19428 permits neoprene solvent cements to withstand higher temperatures than does Durez 12603, a resin which has been marketed for a number of years. Durez 19428 is supplied in crushed form. Some of its typical properties follow:

Clear melting point . . . 75° C.
Specific gravity . . . 1.10
Solubility:

		Solvent Tolerance	Gardner-Holdt Viscosity of 50% Solution
Toluene	soluble	infinite	A_2-A_1
VM&P naphtha	soluble	infinite	I-J
Methyl ethyl ketone	soluble	infinite	A_4
Acetone	soluble	infinite	A_5
Carbon tetrachloride	soluble	infinite	Z_3-Z_4
Mineral spirits	soluble	12.5% resin solids	V-W
Ethanol	insoluble	—	—

Durez 19428 is stable when stored in closed containers in a cool, dry place. It has good compatibility with all types of neoprene and has good solubility in the solvents normally used in neoprene cement formulations.

A five-page service bulletin, No. 305, is available from the company.

ATL Test Chamber

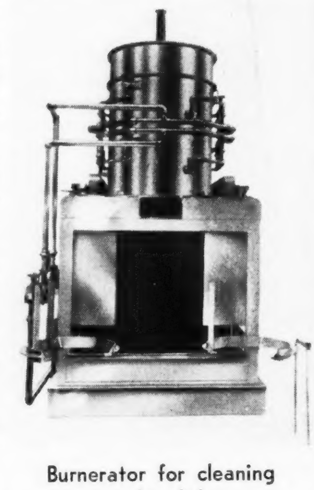
(Continued from page 672)

full view of the chamber interior. The interior is stainless-steel Heliarc welded, and the exterior is enameled Galvanneal. Insulation is seven-inch thick walls of high-density Fiberglas.

Standardization of design and components results in lower costs and rapid delivery—stock to four weeks. An illustrated bulletin, C-12, is available from the manufacturer.

Drum Burnerator

A new method of cleaning drums has been introduced by Atomic Sales Corp., New York, N. Y. Hard-to-clean open-head drums formerly containing sticky resins, asphalt, rubber, or similar materials, can now be burned out in less than a minute by the use of a Drum Burnerator.



Burnerator for cleaning open-head drums

The drum is automatically lifted into the Burnerator in an inverted position and heated by radiation so that the residue is forced off the drum, dropping into a water tank below. This extinguishes the burning residue and keeps smoke at a minimum.

Products of combustion are forced down and back to two stack connections in the rear of the Burnerator. Combustion is said to be so complete that it eliminates most of the smoke, thus meeting the requirements of smoke abatement ordinances. With the Drum Burnerator, it is possible for one man to clean 40 drums an hour.

Ameripol 4700 reduces your raw rubber costs almost 10%

New Ameripol 4700 cuts almost two cents per pound off raw material costs when used as a replacement for 37½-part oil-extended rubber. Ameripol 4700 is a 50-part oil-extended rubber. It costs only 17.5 cents per pound and still maintains end product properties for most applications.

Tensile strength of Ameripol 4700 is actually higher than many 37½-part oil-extended polymers. Its modulus is also higher, and hardness is maintained.

Ameripol 4700 is light colored, making it ideal for many color applications. Get samples and data. Fill out the coupon below and drop it in the mail.

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Cleveland 15, Ohio

Send ☐ samples ☐ data on Ameripol 4700.

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Company__________________
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THE PREFERRED RUBBER

Goodrich-Gulf Chemicals, Inc.

TECHNICAL BOOKS

BOOK REVIEWS

"Encyclopédie Technologique de l'Industrie du Caoutchouc." Volume I. Edited by G. G. Genin and B. Morisson. Published by Dunod, 92 Rue Bonaparte, Paris 6, France. Cloth, 6½ by 9¾ inches, 666 pages, 124 illustrations and diagrams. Price 6,400 francs.

The present work is part of an encyclopedia for the rubber industry designed to cover its various phases: production of crude natural rubbers, their properties, compounding ingredients, and compounding, processing and equipment, and finally the applications, all considered chiefly from the technical and industrial point of view. Scientific questions will be treated concisely, though in sufficient detail to give the reader an over-all idea of the latest basic investigations likely to prove important at the industrial level. When completed, this encyclopedia will consist of five volumes, totaling about 3,200 pages. The third and fourth volumes have already been published; the second is in preparation.

Volume I, published last year, is devoted to the production of natural rubber and was edited by J. Le Bras, Scientific Inspector-General of the Institut Francais du Caoutchouc, who also wrote the foreword. The book consists of two parts. In the 11 chapters of Part I, which include contributions by British, Netherlands, and French experts, are taken up the rubber market; the production of *Hevea* rubber, wild rubbers as well as other types of rubber: ceara, ficus, kok saghiz, guayule; special rubbers (peptized, superior processing, purified rubbers, natural rubber masterbatches, modified rubbers, powders, and skim rubber); preservation and concentration of latex, storing and transportation of latex in the producing and consuming countries; gutta percha and balata; the commercial grades of natural rubber.

Part II, containing 13 chapters, was edited by H. Guinot, who also contributes the introductory chapter to the section reviewing the developments of synthetic rubber production and consumption; the properties of synthetic rubber, compared with those of natural rubber, and basic materials for producing synthetic rubber. The theory of polymerization and copolymerization of olefines and dienes is then discussed by H. F. Mark, director of the Institute of Polymer Research, Polytechnic Institute of Brooklyn. Succeeding chapters deal with the manufacture of butadiene from petroleum, alcohol, and acetylene; the manufacture of isoprene, piperylene, styrene, and acrylonitrile. In the longest chapter in the book, J. B. Donnet, of the Chemical Institute of Mulhouse, discusses the manufacture of buna-type rubbers. The final chapters describe the manufacture of neoprene, butyl, and Thiokol polysulfide types of rubbers.

Statistical data are for the most part brought up to 1954; in some cases to 1955 and 1956. More or less extensive bibliographies are provided at the end of several chapters; those for buna and special rubbers are particularly extensive.

The encyclopedia, when completed, should prove to be a valuable aid to all those studying any of the various aspects of rubbers and the rubber industry.

"Symposium on Radioisotopes." ASTM Special Technical Publication No. 215. Cloth, 6$\frac{3}{16}$ by 9¼ inches, 94 pages. American Society for Testing Materials, Philadelphia, Pa. Price, \$2.75; to members, \$2.20.

This collection of papers on radioisotopes was presented at the second ASTM Pacific area national meeting at Los Angeles, Calif., September 21, 1956. The symposium was sponsored by ASTM Committee E-10 on Radioisotopes and Radiation Effects. The introduction was written by Charles E. Crompton,

associate technical director, National Lead Co., Cincinnati, O., and chairman of Committee E-10, who served also as symposium chairman.

One of the papers will be of particular interest to those in the rubber industry, "Evaluation of Rubber Deterioration by Means of Phosphorus-32," by J. F. Young and C. W. Richards, Douglas Aircraft Co., Santa Monica, Calif. This paper is a report on some preliminary investigations in using phosphorus-32 to trace and indicate the amount of attack on sealants by fluids. The tests using jet fuels and organic liquids were not conclusive, but showed some promise for the future.

The other papers in the symposium were: "Electroplating and Metal Preservation Studies Utilizing Radioisotopes," by Stanley L. Eisler, Rock Island Arsenal Laboratory, Rock Island, Ill.; "Autoradiography as a Testing Technique," by Milton J. Schlesinger, Jr., and Henry J. Gomberg, University of Michigan, Ann Arbor, Mich.; "Use of Radioactive Tracers in the Study of Soil Removal and Detergency," by E. B. Ashcroft, Westinghouse Research Laboratories, Pittsburgh, Pa.; "Refinery Scale Applications of Radioactive Tracers," by V. P. Guinn, H. R. Lukens, Jr., and C. D. Wagner, Shell Development Co., Emeryville, Calif., "Activation Analysis for Industry," by Abel DeHaan, Jr., Tracerlab, Inc., Richmond, Calif.; "Thickness, Density and Concentration Gaging with Radioisotopes," by R. L. Newacheck, and D. L. Forrest, Aerojet-General Nucleonics, San Ramon, Calif., and J. Kohl, Tracerlab, Inc.; "Will ASTM Standards Be Influenced by Radiation Effects in Metals?" by J. C. Wilson and R. G. Berggren, Oak Ridge National Laboratory, Oak Ridge, Tenn.; "The Problem of Establishing Specifications for Irradiated Organic Materials," by O. Sisman, Oak Ridge Lab; and a "General Discussion," by Paul C. Aebersold, Atomic Energy Commission, Oak Ridge.

New Publications

(Continued from page 674)

"No. 27—Rubber: Natural and Synthetic." The Library Association, Chaucer House, London, England. Compiled by E. R. Yescombe, Northern Polytechnic, London. 10 pages. This compilation, in addition to giving a brief definition of rubber, presents a comprehensive subject list including the following topics: bibliographies and guides to sources of information, abstracts, rubber libraries and information centers, historical, economic, encyclopedia, periodicals, directories, terminology, rubber technology, compounding and rubber chemicals, critical tables, ebonite and expanded rubber, engineering and other uses and applications, processing and equipment, reclaim and processing aids, rubber chemistry and physics, rubber planting, testing and aging, and vulcanization.

"Technical Report Writing." By James W. Souther. Paper covers, 10¾ by 9¼ inches. 81 pages. John Wiley & Sons, Inc., New York, N. Y. $2.95. This concise treatise details the fundamentals and simplification of technical report writing. A paperbound manual, it clearly emphasizes the method and processes to be followed in the solution of reporting problems. The author's treatment is essentially a design approach, involving the principles of engineering design, translated to the terms of writing. It relates report form to the use to be made of the report, and in emphasizing report writing processes it differs from most others of its kind.

"Dillon Dynamometers at Work in the World." W. C. Dillon & Co., Inc., Van Nuys, Calif. 92 pages. This special design and application book contains numerous on-the-job illustrations of the company's traction load measuring dynamometers. The pictures show how to make spring testers, measure deflection of aircraft wings, check railroad switches, motor torque, etc., with portable traction dynamometers. Each illustration includes pertinent engineering data and related facts. This book deals solely with traction-type dynamometers used to measure tensile, compression or torque forces. For a limited time it is available at 50¢ a copy. Send company letterhead to the Dillon company.

Technical Books

Publications of the elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.:

"Neoprene Type WB in Wire and Cable." BL-346. By G. B. Ritzinger. 3 pages. Blending Neoprene Type WB with the general-purpose neoprenes is an attractive method for upgrading extrusion smoothness in many wire and cable applications. Compounding and properties of blends are covered in this report.

"Compounding Neoprene Type WB for Increased Flex Cut Growth Resistance and Tear Strength." BL-347. By R. M. Murray. 4 pages. In most vulcanizate properties, Neoprene Type WB compares favorably with other neoprenes, being a highly resilient, oil, weather, and ozone resistant elastomer. However, in tear and tensile strength and resistance to flex cracking and abrasion, it is not so good; therefore, careful consideration should be given to the finished product requirements. This report describes compounding methods which improve considerably the flex cut growth and tear resistance of Type WB by blending with Neoprene Type W and through the proper selection of curing systems, antioxidants, and plasticizers.

"An Aqueous Adhesive System for Bonding Elastomers to Synthetic Fibers; Part II." BL-349. By C. H. Gelbert. 3 pages. BL-338 describes a stable neoprene latex-Hylene MP adhesion system for adhesion between elastomers and synthetic fibers. These adhesives contain no solvents and are insensitive to water at ambient temperatures. This report covers the effect on adhesion of changes in curing conditions, amount of adhesive applied, concentration of Hylene MP, and type of neoprene latex.

"NA-22-Thiuram M Curing Systems for Neoprene Type W." BL-345. By R. C. Scott. 4 pages. The processing safety of Neoprene Type W stocks containing NA-22 can be improved as much as 100% by addition of small amounts of Thiuram M. This improvement is accomplished without sacrificing rate or state of cure. This report describes such systems.

"Compounding Neoprene for Molded-On Shoe Soles." BL-348. By R. W. Bedwell. 8 pages. New techniques for the vulcanization of soles directly to the bottoms of industrial and farm work shoes have created a need of new neoprene oil-resistant sole compounds. This report discusses the means of making such compounds and shows typical working formulations for both black and non-black soles.

"Diak No. 2. A Very Safe Curing Agent for Viton Fluoroelastomers." Report No. 58-9. By A. L. Moran. 5 pages. Diak No. 2 is a blocked diamine-type curing agent effective in all types of Viton formulations, but particularly those containing Viton A-HV. It is economical to use, easy to disperse, and provides outstanding processing safety. Chemically, Diak No. 2 is ethylenediamine carbamate.

Publications of Thiokol Chemical Corp., Trenton, N. J.:

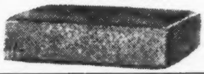
"Liquid Polymer/Epoxy Resin Systems." 13 pages. This basic reference manual provides general information on the increased flexibility, impact, and chemical resistance which are obtainable with this system for protective coatings and adhesives, as well as electrical potting, casting, and plastic tooling applications. It describes the proper methods for selecting and compounding liquid polymers with suitable epoxy resins, curing agents, and fillers to obtain the desired handling and physical properties. Charts and tables are included showing the effect of compounding variables on tensile strength, impact resistance, water absorption, and other important physical properties.

"Butyl Rubber Closed-Cell Sponge." Bulletin 202. 14 pages. The purpose of the study described in this report was to evaluate several common blowing agents for use in compounding butyl sponge, and to determine the effects of blowing agent concentration, curing cycles, and heat conditioning on the properties of closed-cell butyl sponge. An introduction, summary, test procedure, conclusions, and tables are given.

"Add New Sparkle to Your Vinyl Products." Technical Bulletin 496. Claremont Pigment Dispersion Corp., Roslyn Heights, L. I., N. Y. 1 page. This data sheet describes the company's new D Series metallic gold, copper, and silver flitters for use with commercial vinyl compounds.

Low water absorption is one of the big advantages of Philprene* 1503

CURRENT PHILPRENE POLYMERS

	NON-PIGMENTED	PIGMENTED WITH PHILBLACK
		
HOT	PHILPRENE 1000 PHILPRENE 1001 PHILPRENE 1006 PHILPRENE 1009 PHILPRENE 1010 PHILPRENE 1018 PHILPRENE 1019	
COLD	PHILPRENE 1500 PHILPRENE 1502 PHILPRENE 1503	PHILPRENE 1601 PHILPRENE 1605
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Use this *specially finished* rubber for wire and cable stocks, electrical goods, gaskets, and hard rubber products where you need resistance to moisture. To get the physical characteristics you want and, at the same time shed operational troubles like water off a duck's back, use the Philprene rubber that's best for your product.

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Rubber Chemicals Division, 318 Water St., Akron 8, Ohio.

District Offices: Chicago, Dallas, Providence and Trenton.
West Coast: Harwick Standard Chemical Company, Los Angeles, California.
Warehouse Stocks at Akron, Boston, Chicago, and Trenton
Export Sales: 80 Broadway, New York 5, New York.
European Office: Phillips Chemical Company, Limmatquai 70, Zurich 1, Switzerland

*A trademark

MARKET REVIEWS

Natural Rubber

During the December 16-January 15 period on the New York natural rubber market both dealers and manufacturers were good buyers and helped cushion the pre-holiday decline. As shipment offers have increased in volume, however, buyers have fought shy and on the upturn lately appear reluctant to follow as yet, even though the general view favors higher prices.

Matthew S. Fox, vice president of Commodity Exchange, Inc., is optimistic about the outlook for rubber. He stated:

"The projected increased tire business for both passenger cars and trucks, should bring increased consumption in natural rubber with a subsequent increase in the volume of trading in this important commodity on our Exchange. It must be remembered also that while the tire business is vitally important, heavy industry is making greater use today than ever before of natural rubber in heavy construction and heavy equipment. With heavy industry in the picture alongside the automotive industry, it is a fair assumption that trading in rubber futures will increase in volume."

December sales, on the New York Commodity Exchange, amounted to 6,770 tons, compared with 10,070 tons for November contract. There were 21 trading days in December, and 20 during the December 16-January 15 period.

On the physical market, RSS #1, according to the Rubber Trade Association of New York, averaged 30.02¢ per pound for the December 16-January 15 period. Average December sellers' prices for representative grades were: RSS #3, 29.27¢; #3 Amber Blankets, 26.59¢; and Flat Bark, 21.56¢.

Synthetic Rubber

Synthetic rubber consumption in December totaled 86,240 long tons, compared with 79,013 tons used in November, according to the monthly report of The Rubber Manufacturers Association, Inc. With the 46,600 tons of natural rubber consumed in December, total new rubber consumption for the last month of 1958 reached 132,840 tons, against 122,114 for November.

Total new rubber consumption in 1958 in the United States at 1,357,853 tons exceeded the earlier estimate of 1,330,000, by virtue of the higher-than-anticipated fourth-quarter consumption.

Synthetic rubber consumption by types in December, as compared with November, in long tons was as follows: SBR, 71,925, against 65,883; neoprene, 6,800, against 6,211; butyl, 4,950, against 4,419; and nitrile, 2,565, against 2,500. It is understood that one of the most interesting developments in SBR consumption in the last quarter of 1958 was the increase in the use of oil-black masterbatches which, as a result of this fourth-quarter increase, now makes the total 1958 consumption 2½ times that used in 1957.

Exports of synthetic rubber in December rose to 17,270 tons, against the 16,450 tons exported in November, to bring the total for 1958 to 193,179 tons, only about 10,000 tons less than the 1957 export of 203,468 tons.

Stocks of synthetic rubber on hand December 31 totaled 182,639 tons, less than two months' supply.

There were no significant price changes during December. It is reported that synthetic rubber consumption in January is running a little ahead of December use, and first-quarter consumption is expected to exceed the very much improved consumption during the fourth quarter of 1958.

Latex

During the period under review, December 16-January 15, the intervening holiday period was a contributory factor to the somewhat slackening of interest in liquid latex. Owing to the heavier December production some surplus of latex in drums seems to weigh on the market and appears to have caused a temporary halt to the recent advance in the differential.

On the other hand, producers of bulk latex are reported to be fairly well sold for the coming months. Nevertheless the tone of the latex market may best be described as hesitant.

Consumption in the United States in November amounted to 6,540 tons, compared with 7,725 in October. Stocks at 8,795 tons on November 30, against 10,324 at the end of October, represent only about five to six weeks at the current rate of consumption.

Prices for ASTM Centrifuged Concentrated natural latex, in tank-car quantities, f.o.b., rail tank car, ran about 37.92¢ per pound solids. Synthetic latices prices were 21.5 to 38.2¢ for SBR; 37 to 53¢ for neoprene and 46 to 60¢ per pound for the nitrile types.

Final October and preliminary November domestic figures for all latices were reported by the United States Department of Commerce as follows:

(All Figures in Long Tons, Dry Weight)

Type of Latex	Production	Imports	Consumption	Month End Stocks
Natural				
Oct.	0	*	7,725	10,324
Nov.	0	*	6,540	8,795
SBR				
Oct.	7,617	—	6,534	7,129
Nov.	7,307	—	6,009	7,810
Neoprene				
Oct.	1,170	0	979	1,365
Nov.	1,156	0	798	1,498
Nitrile				
Oct.	1,308	0	1,120	2 229
Nov.	1,205	0	1,108	2 530

*Not available yet for period covered.

Scrap Rubber

Fairly good activity was reported in the scrap rubber market preceding the holidays. Reclaimers were taking in scrap regularly, reflecting a pick-up in demand for their products from the automotive industry. The scrap rubber

REX CONTRACT

1959	Dec. 19	Dec. 24	Jan. 2	Jan. 9	Jan. 16
Jan.	29.90	30.15	30.15	30.55	30.20
Mar.	29.80	30.12	30.05	30.45	30.76
May	29.55	29.80	29.90	30.25	30.64
July	29.45	29.70	29.75	30.15	30.55
Sept.	29.43	29.60	29.65	30.15	30.47
Nov.	29.35	29.50	29.55	30.05	30.35
1960					
Jan.	29.25	29.40	29.45	29.95	30.25

NEW YORK OUTSIDE MARKET

	Dec. 19	Dec. 24	Jan. 2	Jan. 9	Jan. 16
RSS #1	29.88	30.38	30.13	30.38	30.38
#2	29.38	29.75	29.63	29.88	29.88
#3	29.00	29.25	29.13	29.38	29.25
Pale Crepe					
#1 Thick	31.88	32.13	32.00	32.13	32.25
Thin	32.13	32.38	32.25	32.38	32.50
#3 Amber Blankets	26.50	27.25	27.38	27.63	27.63
Thin Brown Crepe	26.38	27.13	27.25	27.50	27.50
Standard Bark Flat	21.38	21.50	21.50	22.00	22.13

market at the year-end was better than it had been for some time, with reclaimers said to have been taking all types of scrap rubber.

During the close of the period under review dealers reported a fair volume of business, with reclaimers continuing to accept most grades of scrap regularly. Reclaimer buying reflected movement of reclaimed material to the automotive industry.

Scrap rubber prices remained unchanged since the last review.

	Eastern Points	Akron, O.
	Per Net Ton	
Mixed auto tires	$11.00	$12.00
S. A. G. truck tires	nom.	15.50
Peeling, No. 1	nom.	23.00
2	nom.	20.00
3	nom.	15.50
Tire buffings	nom.	nom.
	(¢ per Lb.)	
Auto tubes, mixed	2.75	2.75
Black	5.75	5.75
Red	6.25	6.25
Butyl	3.50	4.00

Reclaimed Rubber

During the December 16-January 15 period the reclaimed rubber business was reported by one source to have remained very good and a good month was anticipated in January, based on shipments already made for that month and on current orders on hand.

As spring arrives and the automobile production picks up, this source expects even better business.

According to The Rubber Manufacturers Association, Inc., report, December production of reclaimed rubber was 25,400 long tons; while consumption was 24,300 long tons.

Prices of reclaimed rubber continued the same.

RECLAIMED RUBBER PRICES

Whole tire, first line	$0.11
Third line	.1025
Inner tube, black	.16
Red	.21
Butyl	.14
Light carcass	.22
Mechanical, light-colored, medium gravity	.155
Black, medium gravity	.085

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity, at special prices.

Rayon and Nylon

Several leading manufacturers of rayon tire cord during the period under review (December 16-January 15) announced a slight price advance on various packages, amounting to about 2¢ or 3¢ a pound. The price increases reflect a decided improvement in the demand for this product in the last quarter of 1958. Sales of high-tenacity yarn, viscose-type, had fallen off sharply during the recession period, as car manufacturers found their business slumping.

Now, however, there has been a steady upward trend. It does appear nearly certain that car sales will rebound during 1959, and the demand for tire yarn can be expected to do likewise.

Viscose tire yarn has also had increasingly strong competition from nylon in this field, but recently, new types of rayon yarn, lighter but with added strength, have been offered to tire manufacturers. It appears that the newer types of rayon tire cord are considerably superior, according to one source, and will aid the industry in recapturing some business lost to nylon, though perhaps not all.

Yarn companies say that sales of rayon tire yarn in recent weeks have climbed to reasonably good levels, and that the first-quarter outlook is very favorable for this product.

The December and annual 1958 data, including production, shipment, and stock data, on rayon and acetate filament yarn will be available in the next issue of RUBBER WORLD.

RAYON PRICES

Tire Fabrics

1100/490/2	$0.625/$0.78
1650/908/2	.685/ .685
2200/980/2	.625/ .655

Tire Yarns

High-Tenacity	
1100/ 490, 980	.66/ .66
1100/ 490	.66/ .66
1150/ 490, 980	.59/ .63
1165/ 480	.59/ .65
1230/ 490	.59/ .63
1650/ 720	.55/ .58
1650/ 980	.55/ .58
1875/ 980	.55/ .58
2200/ 960	.54/ .57
2200/ 980	.54/ .57
2200/1466	.64
4400/2934	.60
Super-High Tenacity	
1650/ 720	.60
1900/ 720	.58

NYLON PRICES

Tire Yarns

840/ 140	$1.10/$1.20
1680/ 280	1.20

Industrial Fabrics

Although Christmas week in the industrial grey cotton cloth market was busier than ordinarily for a holiday interval, the last week of this period under review (December 16-January 15) was largely a marking time interval in this market. A considerable amount of price checking, delivery scheduling, availability of production information, finishing service details, and related data helped keep the situation interesting during this last week.

Inquiries involved yardages up to and above the half-million-yard level. Some of the interest involved second-quarter production and deliveries. Divided views pertain to the April-June quarter, which take account of wage developments because of which the primary market shows a lack of unanimity regarding whether to or not to negotiate contracts at existing price levels.

There are such dull portions of this market that include hose and belting ducks, wide sheetings for the time being, and there is also the slow-up for grey Army ducks. The latter at the finished goods end are in a seasonal use period. The result is that a need of renewed Army ducks is in the making.

Most 1958 duck and wide cloth production was about 20% below 1957 yardage output, one source reported.

Industrial Fabrics

Broken Twills*		
54-inch, 1.14, 76x52	yd.	$0.52
58-inch, 1.06, 76x52		.585
60-inch, 1.02, 76x52		.5825
Drills*		
59-inch, 1.85, 68x40	yd.	.365
2.25, 68x40		.2975
Osnaburgs*		
40-inch, 2.11, 35x25	yd.	.2275
3.65, 35x25		.1525
59-inch, 2.35, 32x26		.275
62-inch, 2.23, 32x26		.2875
Ducks		
Numbered Duck†		
List less 45%		
Hose and Belting Duck*		
Basis	lb.	.60

Enameling Ducks*

	S. F.	D. F.
38-inch, 1.78 yd.	$0.3263	.3313
2.00 yd.	.275	.28
51.5-inch, 1.35 yd.	.45	.46
57-inch, 1.22 yd.	.4838	.50
61.5-inch, 1.09 yd.	.5413	.5538

Army Duck†		
52-inch, 11.70 oz., 54x40 (8.10 oz./sq.yd.)	yd.	.5925
Sheeting*		
40-inch, 3.15, 64x64	yd.	.2175
3.60, 56x56		.185
52-inch, 3.85, 48x48		.2275
57-inch, 3.47, 48x48		.235
60-inch, 2.10, 64x64		.36
2.40, 56x56		.31
Sateens*		
53-inch, 1.12, 96x60	yd.	.565
1.32, 96x64		.52
57-inch, 1.04, 96x60		.615
58-inch, 1.02, 96x60		.625
1.21, 96x64		.5725
Chafer Fabrics*		
14.40-oz./sq.yd. P.Y.	lb.	.67
11.65-oz./sq.yd. S.Y.		.61
10.80-oz./sq.yd. S.Y.		.61
8.9-oz./sq.yd. S.Y.		.67
40-inch, 2.56, 35x25		.25
60-inch, 1.71, 35x25		.435

*Net 10 days.
†2% 10 days.

STATISTICS

of the RUBBER INDUSTRY

U.S.A. Consumption of Natural (Including Latex) and Synthetic Rubber (Long Tons)

Year	Natural	GR-S	SBR Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1953	553,473	611,748	12,433	77,826	65,900	16,929	1,338,309
1954	596,285	483,001	17,344	61,464	57,203	17,715	1,233,412
1955	634,800	234,963	507,034	53,991	72,876	26,035	1,529,699
1956	562,088	....	724,028	49,581	74,852	25,933	1,436,482
1957							
Jan.	52,631	....	70,978	5,028	7,237	2,247	138,121
Feb.	46,427	....	64,322	4,581	6,235	2,122	123,687
Mar.	48,263	....	67,853	4,998	6,559	2,240	129,913
Apr.	45,368	....	63,280	4,651	6,295	2,129	121,723
May	46,385	....	66,774	4,902	6,441	2,125	126,753
June	41,282	....	58,479	4,198	5,816	1,963	111,738
July	39,683	....	58,021	4,146	5,231	1,646	108,833
Aug.	44,846	....	66,089	4,461	6,502	2,220	124,204
Sept.	43,527	....	64,505	4,654	6,351	2,141	121,326
Oct.	48,782	....	73,850	5,343	7,194	2,433	137,602
Nov.	43,816	....	62,635	4,521	6,136	2,110	119,218
Dec.	38,285	....	56,432	3,930	5,464	1,811	105,922
Total	538,761	....	767,218	55,813	75,661	25,187	1,462,640
1958							
Jan.	42,597	....	60,179	4,508	5,928	2,010	115,222
Feb.	36,711	....	52,962	4,255	5,045	1,968	100,941
Mar.	38,191	....	54,816	4,297	4,965	1,962	104,231
Apr.	36,608	....	55,133	4,621	4,962	1,897	103,221
May	36,014	....	55,463	4,258	4,805	1,778	102,318
June	37,607	....	58,507	4,402	4,844	2,053	107,413
July	34,235	....	53,903	3,791	4,454	1,717	98,190
Aug.	39,444	....	59,458	4,277	5,719	2,308	111,206
Sept.	44,814	....	64,860	4,725	6,405	2,471	123,275
Oct.	48,957	....	73,242	4,982	7,105	2,686	136,972
Nov.*	43,101	....	65,883	4,419	6,211	2,500	122,114

* Preliminary. Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Imports and Production of Natural (Including Latex and Guayule) and Synthetic Rubber (in Long Tons)

Year	Natural	GR-S	SBR Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1953	647,614	668,386	12,342	79,801	80,495	20,198	1,508,837
1954	597,200	472,698	17,707	58,802	69,150	21,396	1,236,601
1955	637,577	236,556	564,589	56,179	91,357	32,623	1,616,478
1956	579,217	....	877,430	75,922	99,412	34,567	1,667,841
1957							
Jan.	46,349	....	76,224	6,366	9,432	2,893	141,264
Feb.	37,487	....	66,023	5,664	9,004	2,894	121,072
Mar.	40,680	....	76,546	6,460	8,031	3,291	135,008
Apr.	59,896	....	65,706	5,890	8,902	2,408	142,802
May	52,566	....	77,542	6,145	9,235	2,561	148,049
June	30,290	....	68,297	4,474	9,678	2,538	137,553
July	44,760	....	67,796	1,972	8,591	2,592	125,711
Aug.	48,951	....	76,197	5,455	9,033	2,737	142,373
Sept.	47,937	....	75,872	6,113	9,726	2,826	142,474
Oct.	49,371	....	87,709	6,085	9,545	3,062	155,772
Nov.	44,583	....	87,152	6,099	9,976	2,803	148,362
Dec.	53,922	....	85,223	6,469	9,568	2,519	157,701
Total	553,043	....	907,534	66,936	110,721	33,124	1,671,358
1958							
Jan.	45,564	....	85,379	6,149	8,804	2,384	148,280
Feb.	46,018	....	66,402	4,996	8,200	2,157	127,773
Mar.	39,885	....	69,230	4,698	7,671	2,042	123,526
Apr.	41,278	....	59,263	4,324	7,973	2,197	115,035
May	36,183	....	62,161	4,462	7,450	2,338	112,594
June	28,279	....	62,567	1,926	7,251	2,306	102,329
July	25,823	....	64,944	3,698	6,248	2,193	102,906
Aug.	39,057	....	73,338	4,455	6,745	2,783	126,378
Sept.	41,343	....	75,111	4,117	8,586	3,165	132,322
Oct.	....	....	82,741	5,338	9,283	3,619	....
Nov.*	....	....	84,382	4,145	10,394	3,575	....

* Preliminary. Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Stocks of Latex

(Long Tons, Dry Weight)

Year	Natural	GR-S*	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1957						
Jan.	11,831	7,191	1,329	1,936	10,456	22,287
Feb.	9,940	7,415	1,169	2,051	10,635	20,575
Mar.	10,173	7,689	1,170	2,157	11,016	21,189
Apr.	12,064	8,096	1,183	1,836	11,115	23,179
May	11,733	7,885	1,407	1,710	11,002	22,735
June	10,931	8,139	1,377	2,001	11,517	22,448
July	12,073	8,045	1,296	1,953	11,294	23,367
Aug.	13,535	7,997	1,309	1,545	10,851	24,386
Sept.	12,315	7,566	1,141	1,700	10,407	23,722
Oct.	12,399	7,254	1,142	1,723	10,119	22,518
Nov.	12,316	7,558	1,265	1,927	10,750	23,066
Dec.	14,454	8,347	1,367	2,374	12,088	26,542
1958						
Jan.	14,178	8,222	1,190	2,052	11,464	25,642
Feb.	15,506	7,992	1,251	2,297	11,540	27,046
Mar.	16,825	7,991	1,281	1,974	11,246	28,071
Apr.	17,415	7,756	1,398	1,744	10,898	28,313
May	17,604	7,240	1,292	1,732	10,264	27,868
June	17,078	7,337	1,267	1,888	10,492	27,570
July	15,516	6,693	1,312	1,990	9,995	25,511
Aug.	13,750	7,166	1,195	2,049	10,410	24,160
Sept.	12,482	6,842	1,354	2,096	10,292	22,774
Oct.	10,324	7,129	1,365	2,229	10,723	21,047
Nov.†	8,795	7,810	1,498	2,530	11,838	20,633

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce. *Includes SBR Types. † Preliminary.

U.S.A. Stocks of Synthetic Rubber

(Long Tons)

Year	SBR Types	Butyl	Neoprene	N-Type	Total
1957					
Jan.	143,177	29,810	13,073	7,664	193,724
Feb.	134,587	29,951	12,705	7,565	184,808
Mar.	131,255	30,814	11,949	7,795	181,813
Apr.	122,764	31,536	12,064	7,247	173,611
May	121,638	31,812	13,010	6,981	173,441
June	120,694	31,569	13,822	7,085	173,170
July	113,143	28,208	15,172	7,125	163,648
Aug.	111,962	28,339	14,603	6,784	161,688
Sept.	109,417	29,132	14,751	7,207	160,507
Oct.	113,382	29,008	15,181	7,134	164,705
Nov.	124,432	29,702	16,453	7,380	177,967
Dec.	140,199	31,489	18,943	7,954	198,585
1958					
Jan.	152,441	31,753	18,691	7,512	210,397
Feb.	151,501	31,369	18,408	7,635	208,914
Mar.	153,221	30,796	18,504	6,947	209,468
Apr.	143,981	30,012	18,764	6,469	199,226
May	137,277	29,246	19,014	6,392	191,929
June	132,800	25,954	18,736	6,231	183,721
July	132,303	24,882	18,242	6,097	181,524
Aug.	136,735	24,618	16,344	6,224	183,921
Sept.	138,987	22,554	15,154	6,145	182,840
Oct.	134,613	22,091	15,474	6,356	178,534
Nov.*	140,673	20,192	15,373	7,273	183,511

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce. *Preliminary.

U.S.A. Rubber Industry Sales and Inventories

(Millions of Dollars)

	Value of Sales*				Manufacturers' Inventories*			
	1955	1956	1957	1958	1955	1956	1957	1958
Jan.	424	415	496	448	790	935	1,047	1,100
Feb.	440	445	495	413	782	970	1,036	1,087
Mar.	466	451	476	412	805	979	1,030	1,112
Apr.	445	445	490	429	784	970	1,031	1,047
May	465	464	481	428	810	985	1,024	1,020
June	465	450	458	445	850	975	1,027	986
July	471	459	514	478	853	987	1,045	980
Aug.	456	436	481	438	863	1,007	1,074	1,024
Sept.	456	429	481	464	874	1,007	1,074	1,024
Oct.	447	454	490	. . .	902	1,022	1,097	. . .
Nov.	482	463	431	. . .	935	1,024	1,101	. . .
Dec.	465	461	427	. . .	934	998	1,092	. . .
Total	5,493	5,372	5,720	. . . Av.	845	988	12,678	. . . .

Source: Office of Business Economics, United States Department of Commerce. *Adjusted for seasonal variation.

U.S.A. Exports of Synthetic Rubber

(Long Tons)

Year	SBR Types	Butyl	Neoprene	N-Type	Total
1957					
May	12,208	603	2,480	517	15,808
June	13,886	762	2,315	492	17,455
July	14,444	1,169	3,426	631	19,670
Aug.	13,795	758	2,786	478	17,817
Sept.	11,625	540	1,964	396	14,525
Oct.	12,200	1,261	2,588	467	16,516
Nov.	12,639	809	2,521	410	16,379
Dec.	15,549	814	2,447	563	19,373
1957					
Total	158,017	8,832	30,242	6,377	203,468
1958					
Jan.	14,109	1,626	2,649	513	18,897
Feb.	9,947	1,415	2,626	378	14,366
Mar.	15,647	757	3,424	410	20,238
Apr.	11,583	949	2,356	698	15,586
May	14,067	1,218	2,899	784	18,968
June	11,995	1,022	1,562	473	15,052
July	10,602	1,051	2,403	674	14,730
Aug.	8,521	972	2,603	558	12,654
Sept.	8,802	812	2,774	518	12,906
Oct.	11,557	1,407	2,547	553	16,799

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Consumption of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	GR-S*	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1957						
May	5,867	5,114	814	731	6,659	12,526
June	5,445	4,790	736	610	6,136	11,681
July	5,180	4,269	677	480	5,426	10,606
Aug.	6,499	5,758	784	823	7,365	13,864
Sept.	6,645	5,676	712	753	7,141	13,786
Oct.	7,250	6,556	788	857	8,201	15,451
Nov.	6,783	5,776	725	712	7,213	13,996
Dec.	5,933	5,260	633	606	6,499	12,432
1957						
Total	75,009	68,305	9,539	10,230	88,074	163,083
1958						
Jan.	6,380	5,438	806	683	6,927	13,307
Feb.	5,380	4,475	640	806	5,921	11,301
Mar.	5,560	4,708	633	720	6,061	11,621
Apr.	4,847	4,093	707	797	5,597	10,444
May	5,004	4,102	785	795	5,682	10,686
June	5,304	4,165	639	919	5,723	11,027
July	4,531	3,433	629	703	4,765	9,296
Aug.	6,094	4,654	764	1,025	6,443	12,537
Sept.	6,748	5,779	820	1,017	7,616	14,364
Oct.	7,725	6,534	979	1,120	8,633	16,358
Nov.†	6,540	6,009	798	1,108	7,915	14,455

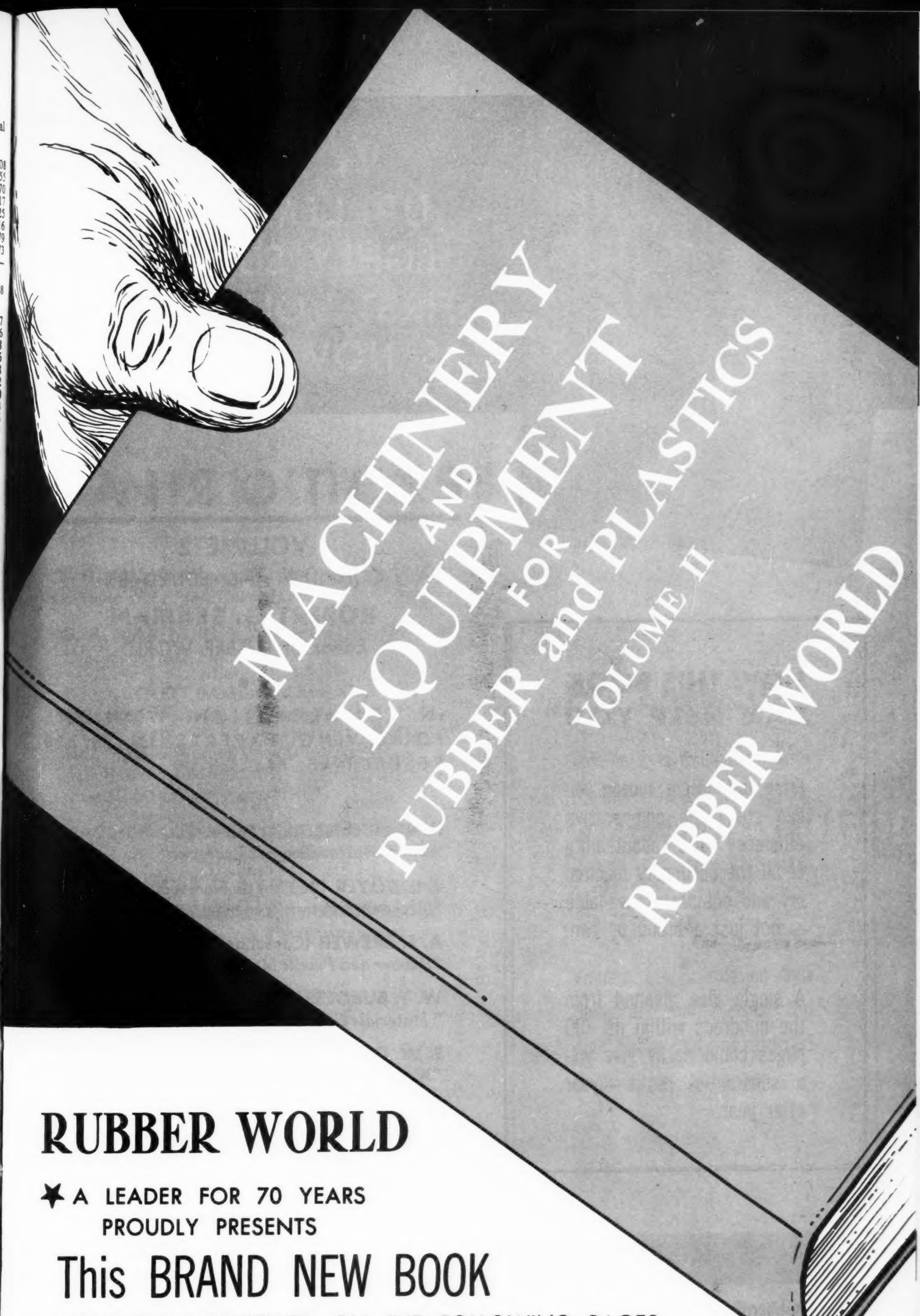
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce. *Includes SBR Types. † Preliminary.

U.S.A. Production of Cotton, Rayon, and Nylon Tire Fabrics

(Thousands of Pounds)

	Cotton and Nylon*		Rayon Tire Cord		
	Cotton Chafer Fabrics and Other Tire Fabrics	Cotton and Nylon Tire Cord and Fabrics	Woven	Not Woven	Total All Tire Cord and Fabrics
1957					
Jan.-Mar.	11,028	20,676	69,610	21,872	124,297
Apr.-June	10,456	24,852	63,195	16,037	115,418
July-Sept.	9,102	24,852	54,968	10,509	100,046
Oct.-Dec.	9,207	23,868	58,356	9,216	100,647
1958					
Jan.-Mar.	9,750	18,820	56,522	8,372	167,924
Apr.-June	7,890	24,725	†	†	80,533
July-Sept.	7,999	24,904	†	†	91,984

* Cotton and nylon figures combined to avoid disclosing data for individual companies. † Withheld to avoid disclosing figures for individual companies.
Source: Bureau of the Census, United States Department of Commerce.



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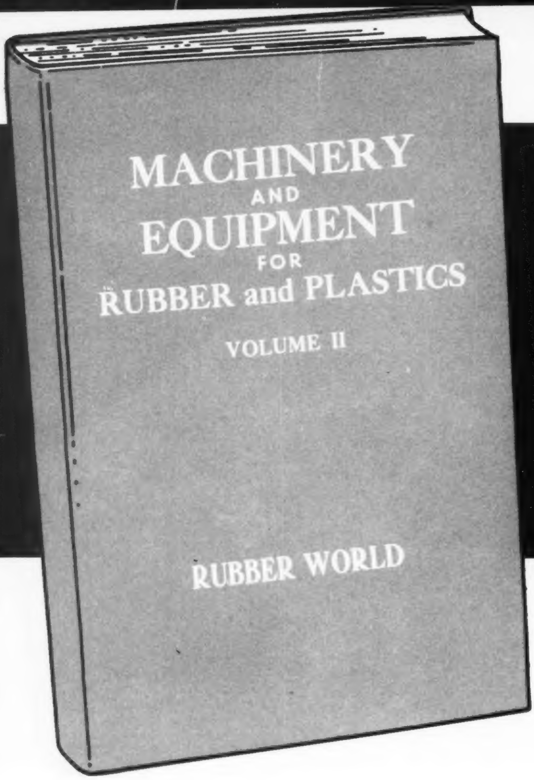

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U.S.A. Imports and Production of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year 1957	Natural	GR-S*	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
June	4,809	5,251	819	886	6,956	11,765
July	6,243	4,646	572	844	6,062	12,305
Aug.	6,834	6,816	874	608	8,298	15,132
Sept.	5,516	5,649	917	1,285	7,851	15,268
Oct.	8,351	6,876	885	1,133	8,894	14,811
Nov.	6,496	6,515	1,021	994	8,530	15,026
Dec.	7,572	5,915	704	734	7,353	14,925
1957 Total	69,513	74,405	10,403	11,637	96,445	165,958
1958						
Jan.	6,289	5,998	788	785	7,571	13,860
Feb.	7,013	3,852	765	671	5,288	12,301
Mar.	7,147	4,880	759	787	6,426	13,573
Apr.	6,348	3,889	907	830	5,626	11,974
May	4,121	3,635	808	882	5,325	9,446
June	4,323	4,539	696	890	6,125	16,573
July	3,158	3,645	677	893	5,215	13,588
Aug.	5,140	5,474	892	1,103	7,469	12,609
Sept.	5,034	6,165	1,075	1,173	8,413	13,447
Oct.	....	7,617	1,170	1,308	10,095	....
Nov.†	....	7,307	1,156	1,205	9,668	....

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce. *Includes SBR types. †Preliminary.

U.S.A. New Supply, Consumption, Exports, and Stock of Reclaimed Rubber

(Long Tons)

Year	New Supply	Consumption	Exports	Stocks
1957				
July	20,444	19,676	757	29,972
Aug.	20,423	22,429	917	28,521
Sept.	19,892	21,704	714	25,983
Oct.	26,419	24,925	1,230	27,171
Nov.	22,083	20,583	1,150	27,855
Dec.	20,101	18,263	843	29,323
1957 Total	273,989	266,852	13,021	29,323
1958				
Jan.	21,159	21,186	892	29,569
Feb.	18,319	18,130	665	28,836
Mar.	19,601	19,300	1,025	28,984
Apr.	19,818	19,746	832	29,440
May	18,942	20,104	1,012	27,862
June	20,549	20,652	1,024	27,763
July	18,136	18,350	1,087	26,442
Aug.	22,432	19,347	900	27,961
Sept.	22,641	21,771	1,005	26,676
Oct.	26,523	23,563	1,028	27,340
Nov.*	22,396	21,271	....	27,680

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce. * Preliminary.

Carbon Black Statistics — First Eleven Months, 1958

Furnace blacks are classified as follows: SRF, semi-reinforcing furnace black; HMF, high modulus furnace black; GPF, general-purpose furnace black; FEF, fast-extruding furnace black; HAF, high abrasion furnace black; SAF, super abrasion furnace black; ISAF, intermediate super abrasion furnace black.

(Thousands of Pounds)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
Production											
Furnace types											
Thermal	12,159	10,070	11,942	10,436	9,378	9,598	10,282	9,049	9,060	10,601	12,086
SRF	22,104	17,946	18,714	14,587	14,750	14,094	18,986	18,539	18,799	20,540	22,840
HMF	5,769	3,190	5,242	4,302	5,257	6,383	5,134	5,463	5,706	5,704	5,505
GPF	4,470	4,852	4,632	4,872	5,183	4,418	4,874	5,680	5,230	5,028	5,921
FEF	16,992	16,398	18,272	17,880	13,384	14,141	14,776	17,472	17,714	20,008	18,765
HAF	39,384	32,054	33,735	42,134	35,256	35,817	40,137	39,389	41,387	40,919	39,931
SAF	—	728	968	934	67	82	—	47	—	—	—
ISAF	13,888	14,739	16,522	12,782	11,011	10,007	14,626	16,551	15,066	16,546	16,198
Total furnace	115,330	99,977	110,027	107,927	94,286	94,540	108,815	112,190	112,962	119,346	121,246
Contact types	28,574	25,712	27,328	26,051	26,623	26,105	28,134	27,946	26,375	27,457	27,042
Totals	143,904	125,689	137,355	133,978	120,909	120,645	136,949	140,136	139,337	146,803	148,288
Shipments											
Furnace types											
Thermal	12,237	8,648	8,762	10,034	8,126	8,703	9,260	10,121	12,552	13,153	11,151
SRF	21,706	18,360	19,869	23,201	19,589	18,612	19,796	22,062	23,341	26,578	23,188
HMF	5,320	5,030	4,355	5,735	4,682	6,066	6,309	5,086	5,561	5,944	5,412
GPF	5,589	4,793	3,721	4,267	3,945	4,885	5,146	4,947	5,025	5,299	5,974
FEF	17,609	17,285	16,780	17,988	15,821	14,908	18,607	19,442	19,965	21,453	19,982
HAF	35,550	32,938	34,433	37,390	36,802	36,620	38,425	39,054	41,014	45,179	41,982
SAF	531	387	560	358	319	809	769	551	931	1,102	902
ISAF	14,359	12,590	14,332	14,310	13,254	13,181	15,489	17,050	15,922	16,886	16,228
Total furnace	112,901	100,031	102,812	113,283	102,547	103,784	113,801	118,313	124,311	135,594	124,819
Contact types	25,571	23,072	23,617	25,863	26,091	23,106	23,645	25,058	24,751	30,244	28,723
Totals	138,472	123,303	126,429	139,146	128,638	137,446	137,446	143,371	149,062	165,838	153,542
Producers' Stocks, End of Period											
Furnace types											
Thermal	20,086	21,508	24,688	25,090	23,342	27,237	28,259	27,187	23,695	21,468	22,403
SRF	75,022	74,608	73,453	64,906	60,123	55,605	54,795	51,312	46,770	40,334	40,069
HMF	10,674	8,834	9,721	8,288	8,863	9,180	8,005	8,382	8,527	8,285	8,304
GPF	8,409	8,468	9,379	9,917	11,090	10,623	10,351	11,044	11,249	10,978	10,914
FEF	32,930	32,043	33,535	33,427	30,990	30,223	26,392	24,422	22,171	21,105	19,888
HAF	57,104	56,220	55,522	60,266	58,720	57,917	59,629	59,964	60,337	56,077	54,026
SAF	7,388	7,729	8,137	8,713	8,457	7,730	6,961	6,457	5,526	4,424	3,517
ISAF	49,406	51,555	53,745	52,217	49,974	46,800	45,937	45,438	44,582	44,242	44,212
Total furnace	261,019	260,965	268,180	262,824	254,559	245,315	240,329	234,206	222,857	206,913	203,333
Contact types	83,776	86,216	89,927	89,885	90,417	93,141	97,630	100,518	102,142	99,510	97,829
Totals	344,795	347,181	358,107	352,709	344,976	338,456	337,959	334,724	324,999	306,423	301,162
Exports											
Furnace types											
Total furnace	23,723	22,719	25,720	24,534	21,879	22,417	24,871	21,406	24,325	23,701	....
Contact types	13,519	10,933	14,018	12,143	12,698	13,369	10,970	8,953	11,356	11,234	....
Totals	37,242	33,652	39,738	36,677	34,577	35,786	35,841	30,359	35,681	34,935	....

Source: Bureau of Mines, United States Department of the Interior, Washington, D. C.

MACHINERY & SUPPLIES FOR SALE (Cont'd)

THIS MONTH'S SPECIALS:
500-ton rubber molding press, 78" x 108" platen; Banbury #3 mixer complete with 75-HP Motor and reducer—all under power; Royle extruders #1, #2, #3, all individually motor driven, 30" and 40" mills battery driven by 100-HP and 200-HP motors, all under power.
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World Production of Synthetic Rubber

(1,000 Long Tons)

Year	U.S.A.	Canada	Germany	Total
1957				
Aug.	93.4	11.0	1.1	105.6
Sept.	94.5	10.9	1.0	106.4
Oct.	106.4	11.4	1.1	118.9
Nov.	106.0	11.5	1.0	118.5
Dec.	103.8	11.5	0.6	115.9
1957 Total	1,118.3	132.1	11.6	1,262.0
Jan.	102.7	10.9	1.8	115.4
Feb.	81.8	9.1	1.0	91.9
Mar.	83.6	11.3	1.2	96.2
Apr.	73.8	11.1	1.1	85.9
May	76.4	11.2	1.2	88.8
June	74.1	10.2	1.1	85.4
July	77.1	11.2	1.0	89.3
Aug.	87.3	10.9	0.8	99.0
Sept.	90.9	11.5	0.9	103.3
Oct.	100.9	12.5	...	...

Source: Secretariat of the International Rubber Study Group; and Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

World Production of Natural Rubber

(1,000 Long Tons)

Year	Malaya Estate	Malaya Native	Indonesia Estate	Indonesia Native	All Other	Total
1957						
July	32.5	24.1	21.0	65.9	46.5	192.5
Aug.	33.0	23.2	21.8	52.4	44.8	175.0
Sept.	31.5	21.4	21.8	37.8	35.0	157.5
Oct.	33.4	22.6	22.2	32.8	54.0	165.0
Nov.	34.4	22.7	22.2	24.5	51.2	155.0
Dec.	32.4	22.1	21.1	32.4	62.0	170.0
1957 Total	369.8	268.9	252.2	432.3	556.7	1,892.5
1958						
Jan.	35.8	25.4	22.5	11.5	52.5	145.0
Feb.	28.8	22.9	20.0	8.8	37.0	117.5
Mar.	28.4	20.3	19.7	27.5	46.5	142.5
Apr.	26.7	18.3	16.8	24.0	44.2	130.0
May	27.2	18.2	17.7	20.1	44.3	127.5
June	31.2	21.9	19.7	26.0	43.7	142.5
July	36.5	23.8	20.8	45.3	48.5	175.0
Aug.	34.0	24.8	19.5	42.9	48.8	170.0
Sept.	33.8	23.6	19.0	38.6	52.5	167.5
Oct.	35.1	23.7	20.1	43.4	47.9	170.0

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce; Secretariat of the International Rubber Study Group.

World Consumption of Natural Rubber

(1,000 Long Tons)

Year	United States	Eastern Europe and China	United Kingdom	Other Foreign	Total Foreign	Grand* Total
1957						
Aug.	44.9	28.0	9.7	66.8	104.5	150.0
Sept.	43.7	18.7	18.1	78.4	115.2	157.5
Oct.	48.8	12.2	15.3	75.7	106.2	155.0
Nov.	43.8	19.2	15.1	...	108.8	152.5
Dec.	38.3	18.5	17.7	70.8	104.2	142.5
1957 Total	539.8	263.5	181.6	885.5	1,330.2	1,870.0
1958						
Jan.	42.6	21.8	15.3	73.5	110.6	152.5
Feb.	36.7	30.5	16.1	71.5	118.1	155.0
Mar.	38.2	31.6	16.9	73.7	122.2	160.0
Apr.	36.6	43.0	13.4	72.8	115.6	165.0
May	36.0	28.7	14.7	71.6	100.3	150.0
June	37.6	43.7	16.1	74.6	129.9	167.5
July	34.2	27.9	12.7	74.0	115.8	150.0
Aug.	39.4	33.4	8.7	60.6	102.7	147.5
Sept.	44.8	49.3	16.8	78.7	145.2	190.0
Oct.	48.9	...	14.2	...	...	...

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce; and Secretariat of the International Rubber Study Group.
*Estimated.

U.S.A. Synthetic Rubber Industry, Wages, Hours

Year	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings
1957			
July	108.75	41.2	2.64
Aug.	109.34	40.8	2.68
Sept.	108.40	40.6	2.67
Oct.	108.14	40.5	2.67
Nov.	112.73	41.3	2.73
Dec.	112.34	41.3	2.72
1958			
Jan.	109.62	40.6	2.70
Feb.	109.21	40.6	2.69
Mar.	110.03	40.6	2.71
Apr.	108.14	40.2	2.69
May	110.03	40.6	2.71
June	112.61	41.1	2.74
July	111.52	40.7	2.74
Aug.	112.75	41.0	2.75
Sept.	114.11	40.9	2.79

Source: BLS, United States Department of Labor.

World Consumption of Synthetic Rubber*

(1,000 Long Tons)

Year	U.S.A.	Canada	United Kingdon	Total† Continent of Europe	World† Grand Total
1957					
July	69.0	3.5	4.3	14.0	97.5
Aug.	79.3	2.8	3.0	11.2	102.5
Sept.	77.7	3.7	6.4	14.0	110.0
Oct.	88.8	4.1	5.5	14.8	120.0
Nov.	75.4	4.0	5.0	14.0	105.0
Dec.	67.6	3.6	6.0	13.3	95.0
1957 Total	929.3	47.5	57.4	154.8	1,262.5
1958					
Jan.	72.6	3.5	5.2	14.0	100.0
Feb.	64.2	3.5	5.2	13.5	92.5
Mar.	66.0	3.5	6.6	14.3	97.5
Apr.	66.6	3.8	4.7	13.5	95.0
May	66.3	4.0	5.5	13.3	95.0
June	69.8	4.5	6.0	13.5	100.0
July	63.9	3.9	4.7	13.8	92.5
Aug.	71.8	3.0	3.1	13.5	95.0
Sept.	78.5	4.2	5.8	10.3	110.0
Oct.	88.0	4.1	4.8	14.0	117.5

Source: Secretariat of the International Rubber Study Group; Bureau of the Census, Industry Division, Chemical Branch, U. S. Department of Commerce.
* Includes latices. † Figures estimated or partly estimated.

U.S.A. Automotive Inner Tubes

(Thousands of Units)

Year	Shipments: Original Equipment	Shipments: Replacement	Shipments: Export	Shipments: Total	Production	Inventory End of Period
1957						
July	258	3,364	86	3,708	2,941	6,287
Aug.	243	3,358	81	3,683	3,134	5,966
Sept.	213	3,180	90	3,483	3,365	6,174
Oct.	242	2,809	121	3,172	3,764	6,909
Nov.	259	2,468	65	2,792	2,585	6,250
Dec.	225	2,392	101	2,717	2,778	7,671
1957 Total	3,045	35,684	1,077	39,806	39,763	
1958						
Jan.	232	4,005	71	4,309	3,344	6,699
Feb.	209	3,014	73	3,296	3,443	6,983
Mar.	209	3,481	74	3,764	3,685	7,066
Apr.	223	2,956	64	3,243	3,624	7,609
May	225	2,742	68	3,035	3,530	8,189
June	202	3,332	67	3,601	3,476	8,156
July	215	3,174	76	3,466	2,890	7,680
Aug.	160	3,097	74	3,331	3,305	7,664
Sept.	207	3,228	63	3,498	3,390	7,657
Oct.	244	3,237	84	3,567	3,768	7,869
Nov.	264	2,575	60	2,899	3,319	8,372

Source: The Rubber Manufacturers Association, Inc.

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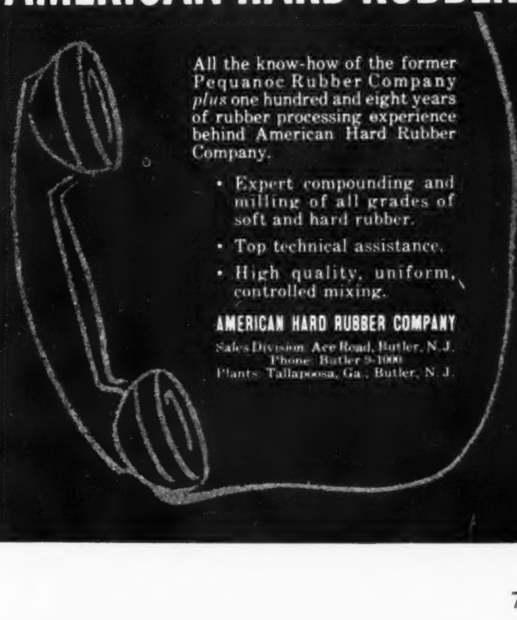

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U.S.A. Automotive Pneumatic Casings

(Thousands of Units)

	Shipments: Original Equipment	Shipments: Replacement	Shipments: Export	Shipments: Total	Production	Inventory End of Period
Passenger Car						
1957						
Jan.	3,192	4,521	100	7,812	8,296	16,978
Feb.	3,017	4,453	68	7,538	8,047	17,376
Mar.	3,051	4,875	80	8,006	8,629	18,065
Apr.	2,809	5,218	78	8,104	7,878	17,821
May	2,831	5,166	60	8,057	8,313	18,050
June	2,623	5,532	63	8,217	7,462	17,322
July	2,719	5,826	65	8,611	7,449	16,097
Aug.	2,886	5,675	66	8,627	7,801	15,348
Sept.	1,398	5,096	70	6,564	7,535	16,310
Oct.	2,298	4,392	88	6,778	8,437	17,998
Nov.	3,179	3,250	62	6,491	6,575	15,596
Dec.	2,803	2,858	78	5,739	6,597	19,818
Total	32,724	56,605	888	90,217	93,547	19,818
1958						
Jan.	2,376	4,838	50	7,264	6,740	19,298
Feb.	1,998	3,777	57.5	5,833	6,320	19,820
Mar.	1,845	4,726	49.3	6,621	6,569	19,786
Apr.	1,594	5,517	61.4	7,173	6,522	19,051
May	1,874	5,593	55.8	7,523	6,715	18,263
June	1,667	6,387	62.8	8,117	7,306	17,465
July	1,756	6,502	60.0	8,318	6,368	15,490
Aug.	847	5,807	57.2	6,711	6,753	15,535
Sept.	1,170	5,425	63.9	6,659	7,134	16,045
Oct.	1,522	5,369	80.6	6,972	7,983	17,134
Nov.	3,056	3,651	57.7	6,765	7,182	17,420
Truck and Bus						
1957						
Jan.	305	678	83	1,066	1,208	3,512
Feb.	344	598	59	1,001	1,122	3,633
Mar.	330	704	74	1,107	1,136	3,678
Apr.	438	771	49	1,277	1,072	3,486
May	399	620	74	1,094	1,178	3,580
June	370	715	64	1,149	1,027	3,461
July	349	819	61	1,229	994	3,219
Aug.	328	813	65	1,206	1,117	3,129
Sept.	290	805	63	1,158	1,105	3,083
Oct.	322	959	94	1,375	1,271	2,987
Nov.	337	626	59	1,021	1,060	3,207
Dec.	266	484	70	820	1,018	3,408
Total	4,041	8,544	845	13,430	13,394	3,408
1958						
Jan.	277	674	57	1,007	1,074	3,470
Feb.	254	598	52	904	994	3,572
Mar.	269	608	46	923	1,004	3,659
Apr.	282	666	55	1,002	955	3,607
May	299	626	54	980	938	3,571
June	265	794	54	1,113	988	3,456
July	265	940	51	1,255	920	3,114
Aug.	208	871	57	1,136	1,009	2,986
Sept.	273	940	41	1,253	1,143	2,880
Oct.	316	1,106	59	1,482	1,361	2,779
Nov.	313	669	42	1,023	1,211	2,983
Total Automotive						
1957						
Jan.	3,496	5,199	183	8,878	9,504	20,490
Feb.	3,361	5,052	127	8,539	9,169	21,009
Mar.	3,381	5,579	154	9,114	9,766	21,743
Apr.	3,246	5,989	146	9,381	8,950	21,308
May	3,230	5,787	134	9,150	9,490	21,630
June	2,993	6,247	127	9,366	8,489	20,783
July	3,068	6,646	126	9,840	8,443	19,316
Aug.	3,214	6,488	130	9,833	8,917	18,477
Sept.	1,688	5,902	133	7,723	8,641	19,393
Oct.	2,620	5,351	182	8,154	9,708	20,985
Nov.	3,516	3,876	121	7,513	7,636	18,803
Dec.	3,070	3,341	148	6,559	7,615	23,225
Total	36,764	65,150	1,734	103,647	106,941	23,225
1958						
Jan.	3,653	5,511	107	8,271	7,814	22,769
Feb.	2,253	4,374	110	6,737	7,314	23,392
Mar	2,114	5,334	95	7,543	7,573	23,446
Apr.	1,876	6,183	116	8,175	7,477	22,658
May	2,173	6,220	110	8,503	7,652	21,834
June	1,932	7,182	117	9,231	8,293	20,920
July	2,020	7,442	111	9,573	7,288	18,604
Aug.	1,055	6,679	115	7,848	7,762	18,521
Sept.	1,442	6,365	105	7,912	8,277	18,925
Oct.	1,838	6,476	140	8,454	9,344	19,913
Nov.	3,369	4,320	100	7,788	8,393	20,403

Source: The Rubber Manufacturers Association, Inc.

U.S.A. Rubber Industry Employment, Wages, Hours

Year	Production Workers (1000's)	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings	Consumer's Price Index
		All Rubber Products			
1939	121.0	$27.84	39.9	$0.75	
1957					
June	196.8	91.21	40.9	2.23	120.2
July	199.9	94.16	41.3	2.28	120.8
Aug.	204.3	92.84	40.9	2.27	121.0
Sept.	206.4	93.02	40.8	2.29	121.1
Oct.	209.5	93.03	40.1	2.32	121.1
Nov.	209.0	93.20	40.0	2.33	121.6
Dec.	207.3	92.40	40.0	2.31	121.6
1958					
Jan.	260.5	87.48	38.2	2.29	122.3
Feb.	256.9	85.04	37.3	2.28	122.5
Mar.	243.6	87.02	38.0	2.29	123.5
Apr.	234.7	85.88	37.5	2.29	123.6
May	230.5	87.86	38.2	2.29	123.7
June	233.5	91.10	39.1	2.33	123.9
July	233.1	91.89	39.2	2.35	123.7
Aug.	238.9	96.80	40.5	2.39	123.7
Sept.	245.0	96.87	40.7	2.38	123.7
		Tires and Tubes			
1939	54.2	$33.36	35.0	$0.96	
1957					
June	78.2	107.23	41.4	2.59	
July	84.4	112.20	42.5	2.64	
Aug.	84.2	107.83	41.0	2.63	
Sept.	84.4	107.20	40.3	2.66	
Oct.	84.4	105.18	39.1	2.69	
Nov.	84.0	106.62	39.2	2.72	
Dec.	83.6	105.84	39.2	2.70	
1958					
Jan.	109.2	98.52	36.9	2.67	
Feb.	105.6	93.02	35.1	2.65	
Mar.	102.5	98.05	37.0	2.65	
Apr.	98.4	95.67	36.1	2.65	
May	96.3	99.48	37.4	2.66	
June	96.8	103.63	38.1	2.72	
July	96.7	106.59	38.9	2.74	
Aug.	98.1	113.96	40.7	2.80	
Sept.	100.0	112.16	40.2	2.79	
		Rubber Footwear			
1939	14.8	$22.80	37.5	$0.61	
1957					
June	17.4	72.29	39.5	1.83	
July	16.9	72.13	39.2	1.84	
Aug.	17.2	73.05	39.7	1.84	
Sept.	17.6	74.45	39.6	1.88	
Oct.	17.7	76.02	39.8	1.91	
Nov.	18.0	78.96	40.7	1.94	
Dec.	17.9	79.35	40.9	1.94	
1958					
Jan.	21.8	74.87	39.2	1.91	
Feb.	21.5	74.68	39.1	1.91	
Mar.	20.9	76.61	39.9	1.92	
Apr.	20.7	75.46	39.3	1.92	
May	20.6	75.85	39.3	1.93	
June	20.5	77.20	40.0	1.93	
July	20.1	75.25	39.4	1.91	
Aug.	20.6	77.18	40.2	1.92	
Sept.	21.1	76.82	39.6	1.94	
		Other Rubber Products			
1939	51.9	$23.34	38.9	$0.61	
1957					
June	101.2	81.81	40.7	2.01	
July	98.6	82.62	40.7	2.03	
Aug.	102.9	83.84	41.1	2.04	
Sept.	104.4	85.08	41.1	2.07	
Oct.	107.4	86.10	41.0	2.10	
Nov.	107.0	85.05	40.5	2.10	
Dec.	105.8	84.03	40.4	2.08	
1958					
Jan.	129.5	80.94	39.1	2.07	
Feb.	123.8	80.32	38.8	2.07	
Mar.	120.2	79.87	38.4	2.08	
Apr.	115.6	79.87	38.4	2.08	
May	113.6	80.29	38.6	2.08	
June	116.2	83.77	39.7	2.11	
July	116.3	83.53	39.4	2.12	
Aug.	120.2	86.24	40.3	2.14	
Sept.	123.9	88.38	41.3	2.14	

Source: BLS, United States Department of Labor.

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